ARCHAEOLOGICAL INVESTIGATIONS AT SITE 45-OK-11
CHIEF JOSEPH DAM PROJECT, WASHINGTON

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by

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Final report submitted to the U.S. Army Corps of Engineers, Seattle District, in partial fulfillment of the conditions and specifications of Contract No. DACW67-78-C-0106.

The technical findings and conclusions in this report do not necessarily reflect the views or concurrence of the sponsoring agency.

Office of Public Archaeology
Institute for Environmental Studies
University of Washington

1984

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ABSTRACT

Site 45-OK-11 is on the north bank of the Columbia River in Okanogan County, between River Mile 576 and 577. The University of Washington excavated 1020 m^3 of site volume from 1978-1980 for the U.S. Army Corps of Engineers, Seattle District, as part of a mitigation program associated with adding 10 ft to the operating pool level behind Chief Joeph Dam. Systematic aligned random sampling with 1 x 1 x .01 m units of record in 1 x 2 or 2 x 2-m cells disclosed two major cultural components representing the Hudnut and Kartar Phases.

The earlier, Kartar component (between ca. 5100-4200 B.P.) consisted of a permanent pithouse settlement, which, in at least one instance, comprised 3-4 contemporaneous pithouse and associated external activity surfaces. Floral and faunal remains document year-round activity. Tool kits and identified remains show an emphasis on the hunting of large game, supplemented by shellfish collection, plant gathering, and fishing. Cascade and Cold Springs type projectile points, a Levallois-like blade technology, an intensive cobble tool industry, and a well-developed bone tool industry indicate that the site assemblage is related to the Cascade Phase in the Lower Snake River region. It also contains a number of triangular projectile point types and other artifact types characteristic of the Frenchman Springs and Tucannon Phases of adjacent regions, and is transitional to later phases.

During the Hudnut Phase (from ca. 3900-2800 B.P.), the site served as a frequent short-term camp. Floral and faunal remains evidence spring-early summer activity. The tool assemblage and faunal remains suggest hunting was still a paramount activity, again supplemented by shellfish collection, plant gathering, and fishing.

Although there is a radical change in site use at this particular location between the Katar housepit village and the Hudnut short-term camp, maintained housepit settlements like that identified for the Kartar Phase occupation at 45-OK-11 are found in other Hudnut Phase in the Rufus Woods Lake Project area. The existence of permanent winter village sites at such an early date and the similarity in adaptive strategies it demonstrates, suggests a different path of cultural development than has been postulated for some regions.

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Site 45-OK-11 is located on land owned by Arthur R. McCuen. We thank Mr. McCuen for his cooperation and for granting us permission to excavate the site.

As authors of this report, we take responsibility for its contents. What we have written here is only the final stage of a collaborative process which is analogous to the integrated community of people whose physical traces we have studied. Some, by dint of hard labor and archaeological training, salvaged those traces from the earth; others processed and analyzed those traces; some manipulated the data and some wrote, edited and produced this report. Each is a member of the community essential to the life of the work we have done.

Jerry V. Jermann, Co-principal Investigator during the field excavation and artifact analysis phase of the project, developed site excavation sampling designs that were used to select data from each site. The designs provided a uniform context for studying prehistoric subsistence-settlement patterns in the project area. Kevin Peter supervised the excavation of 45-OK-11.

S. Neal Crozier did the initial data summary for the stratigraphic analysis; he also performed the chemical and mechanical sort analyses. Larry Hause contributed to the stratigraphic analysis. Sarah K. Campbell compiled the data for analytic zone definitions. The laboratory staff, under the direction of Karen Whittlesey and Kathy Lewin, did the technological and functional artifact analysis. Janice Jaehnig did keypunching and John Chapman and Duncan Mitchell manipulated the computerized data.

The writing of the report itself is a cooperative effort. Dr. Ernest S. Lohse wrote Chapters 1 and 3, and, with Dr. Manfred E.W. Jaehnig, Chapter 7. As senior author, he also coordinated and integrated the contributions of the other authors. S. Neal Crozier wrote the stratigraphy section of Chapter 2 and Sarah K. Campbell wrote the analytic zone portion. Stephanie Livingston analyzed the faunal assemblage and wrote Chapter 4; Dr. Nancy A. Stenholm analyzed the botanical assemblage and wrote Chapter 5; and Dorothy Sammons-Lohse analyzed the features and wrote Chapter 6.

Marc Hudson edited the text; Dawn Brislawn typed it, and coordinated production. Fred Clark did the preliminary versions of many of the figures and Melodie Tune drafted the final versions. Larry Bullis photographed the artifacts. Karen Whittlesey and Marilyn Hawkes were responsible for printing the feature photographs. Production of the final camera ready copy was accomplished by Charlotte Beck, Pippa Colley, Patricia Ruppe, and Julie Tomita under the direction of Sarah Campbell.

PREFACE

The Chief Joseph Dam Cultural Resources Project (CJDCRP) has been sponsored by the Seattle District, U.S. Army Corps of Engineers (the Corps) in order to salvage and preserve the cultural resources imperiled by a 10 foot pool raise resulting from modifications to Chief Joseph Dam.

From Fall 1977 to Summer 1978, under contract to the Corps, the University of Washington, Office of Public Archaeology (OPA) undertook detailed reconnaissance and testing along the banks of Rufus Woods Lake in the Chief Joseph Dam project area (Contract No. DACW67-77-C-0099). The project area extends from Chief Joseph Dam at Columbia River Mile (RM) 545 upstream to RM 590, about seven miles below Grand Coulee Dam, and includes 2,015 hectares (4,979 acres) of land within the guide-taking lines for the expected pool raise. Twenty-nine cultural resource sites were identified during reconnaissance, bringing the total number of recorded prehistoric sites in the area to 279. Test excavations at 79 of these provided information about prehistoric cultural variability in this region upon which to base further resource management recommendations (Jermann et al. 1978; Leeds et al. 1981).

Only a short time was available for testing and mitigation before the planned pool raise. Therefore, in mid-December 1977, the Corps asked OPA to review the 27 sites tested to date and identify those worthy of immediate investigation. A priority list of six sites, including 45-OK-11, was compiled. The Corps, in consultation with the Washington State Historic Preservation Officer and the Advisory Council on Historic Preservation, established an interim Memorandum of Agreement under which full-scale excavations at those six sites could proceed. In August 1978, data recovery (Contract No. DACW67-78-C-0106) began at five of the six sites.

Concurrently, data from the 1977 and 1978 testing, as well as those from previous testing efforts (Osborne et al. 1952; Lyman 1976), were synthesized into a management plan recommending ways to minimize loss of significant resources. This document calls for excavations at 34 prehistoric habitation sites, including the six already selected (Jermann et al. 1978). The final Memorandum of Agreement includes 20 of these. Data recovery began in May 1979 and continued until late August 1980.

Full-scale excavation could be undertaken at only a limited number of sites. The testing program data allowed identification of sites in good condition that were directly threatened with inundation or severe erosion by the projected pool raise. To aid in selecting a representative sample of prehistoric habitation sites for excavation, site "components" defined during testing were characterized according to (1) probable age, (2) probable type of occupation, (3) general site topography, and (4) geographic location along the river (Jermann et al. 1978:Table 18). Sites were selected to attain as wide a diversity as possible while keeping the total number of sites as low as possible.

The Project's investigations are documented in four report series. Reports describing archaeological reconnaissance and testing include (1) a management plan for cultural resources in the project area (Jermann et al. 1978), (2) a report of testing at 79 prehistoric habitation sites (Leeds et al. 1981), and (3) an inventory of data derived from testing. Series I of the mitigation reports includes (1) the project's research design (Campbell 1984d) and (2) a preliminary report (Jaehnig 1983b). Series II consists of 14 descriptive reports on prehistoric habitation sites excavated as part of the project (Campbell 1984b; Jaehnig 1983a, 1984a,b; Lohse 1984a-f; Miss 1984a-d), reports on prehistoric nonhabitation sites (Campbell 1984a) and burial relocation projects (Campbell 1984c), and a report on the survey and excavation of historic sites (Thomas et al. 1984). A summary of results is presented in Jaehnig and Campbell (1984).

This report is one of the Series II mitigation reports. Mitigation reports document the assumptions and contingencies under which data were collected, describe data collection and analysis, and organize and summarize data in a form useful to the widest possible archaeological audience.

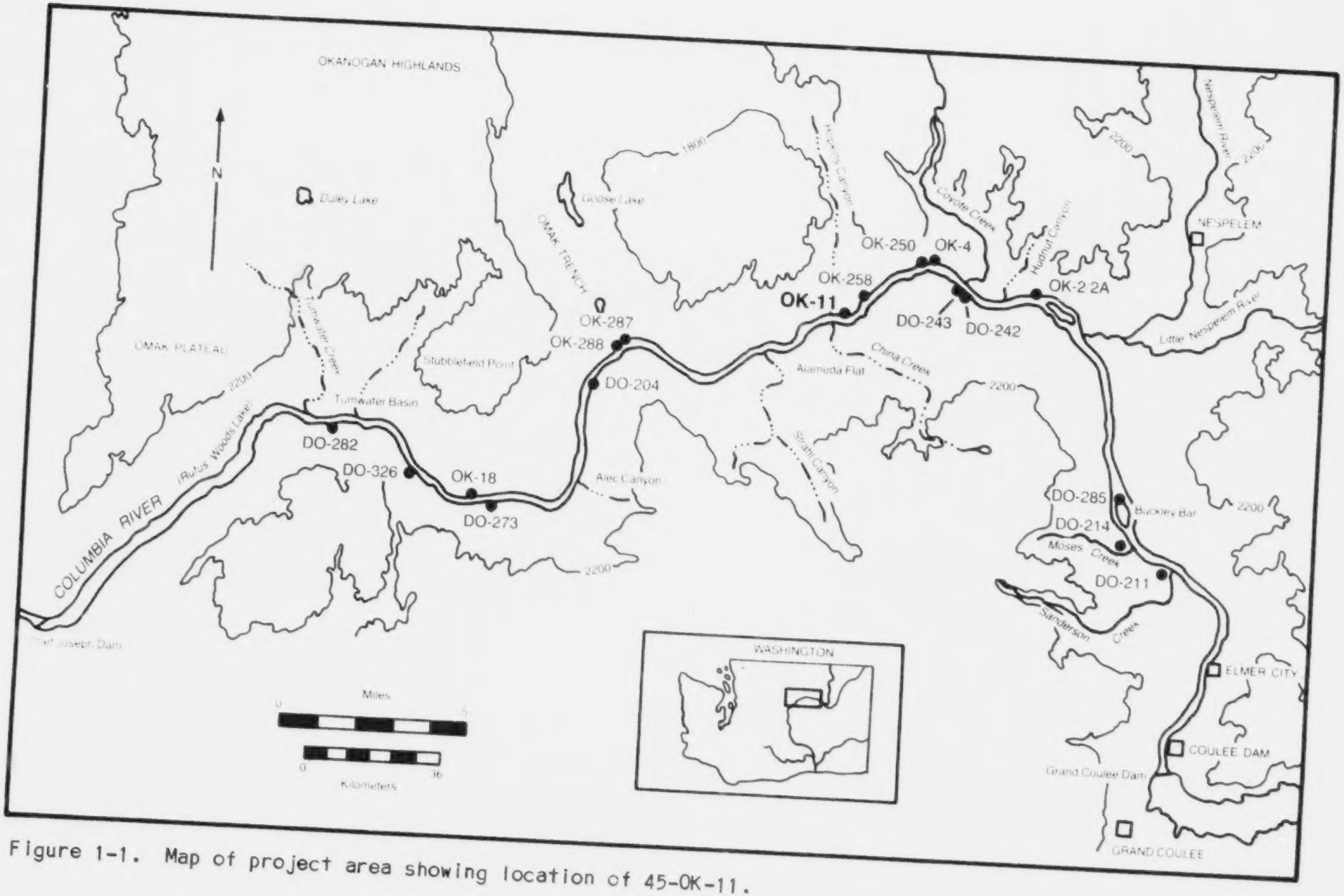
1. INTRODUCTION

At site 45-OK-11, the project conducted one of its most extensive excavations to recover the remains of a housepit village dating between 5500 and 4500 B.P. (Kartar Phase). The dense deposit of well-preserved cultural remains from this site provided the first evidence of sedmentary or semi-sedmentary occupations during this period in the Big Bend region. As the period becomes increasingly well known through additional work in the Rufus Woods Reservoir (Chatters 1984) and ongoing work by Central Washington University in the Wells Reservoir, site 45-OK-11 will continue to be a major datum in interpreting settlement subsistence/systems of this time period. It also offers significant research potential for models of cultural change over longer periods of time. The Hudnut Phase component at 45-OK-11, although it follows the Kartar Phase occupations in time, is different in function, as discussed in this report.

SITE SETTING

Site 45-OK-11 is on the north bank of the Columbia River midway between River Mile (RM) 575 and 576 on the Colville Indian Reservation in Okanogan County (Figure 1-1). It lies in the NE1/4 of the NE1/4 of Section 4, T31N, R29E, Alameda Flat Quadrangle (U.T.M. Zone 11, N5333000, E338500). The site lies on a low terrace, cut into a gently sloping alluvial fan, just south of the mouth of Hopkins Canyon (Figure 1-2). At 291 meters (954 ft) above mean sea level, the site is about three meters above the normal level of Rufus Woods Lake and 12 m above the pre-dam level of the Columbia River. It has a pleasant southern aspect and fine sandy surface that holds warmth from the winter sun. In recent years, the site has been planted and used as pasture. Below a 20-30 cm plow zone, historic disturbance has been slight. The rising waters of Rufus Woods Lake, however, have badly eroded the site. The extent of this erosion is borne out by Munsell and Salo's (1977) reconnaissance report which noted two housepit depressions and dense cultural deposits in the river cutbank. In 1977, just two years after their survey, these features were gone, destroyed with the collapse of at least two meters of site deposit.

Steep terraces of Nespelem Silt and outcrops of gneissic granite bedrock flank the site on the north. The broad mouth of Hopkins Canyon and numerous small draws provide access to a variety of upland enviroments (Figure 1-3). Flanking the Canyon on the west and east are Whitmore Mountain (3,949 ft) and Hamilton Mountain (2,868 ft), the highest nearby elevations. To the south and west, across the river, stepped terraces of Nespelem Silt and Columbia River gravels rise up to meet the flat, dissected Columbia Plateau.


OKANOGAN HIGHLANDS
N
Duley Lake
OMAK PLATEAU
2200
Tunwater Creek
Tunwater Basin
Stubblefield Point
OMAK TRENCH
Goose Lake
1800
Hopkins Canyon
Coyote Creek
Hudnut Canyon
2200
Nespelem River
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NESPELEM
Little Nespelem River
OK-250
OK-4
OK-258
OK-11
OK-2 2A
DO-243
DO-242
OK-287
OK-288
DO-204
Alameda Flat
China Creek
2200
DO-282
DO-326
OK-18
DO-273
Alec Canyon
Strahl Canyon
2200
DO-285
Buckley Bar
2200
DO-214
Moses Creek
DO-211
Sanderson Creek
COLUMBIA RIVER
(Rufus Woods Lake)
Chief Joseph Dam
Miles
0
5
0
36
Kilometers
WASHINGTON
ELMER CITY
COULEE DAM
Grand Coulee Dam
GRAND COULEE

Figure 1-1. Map of project area showing location of 45-OK-11.

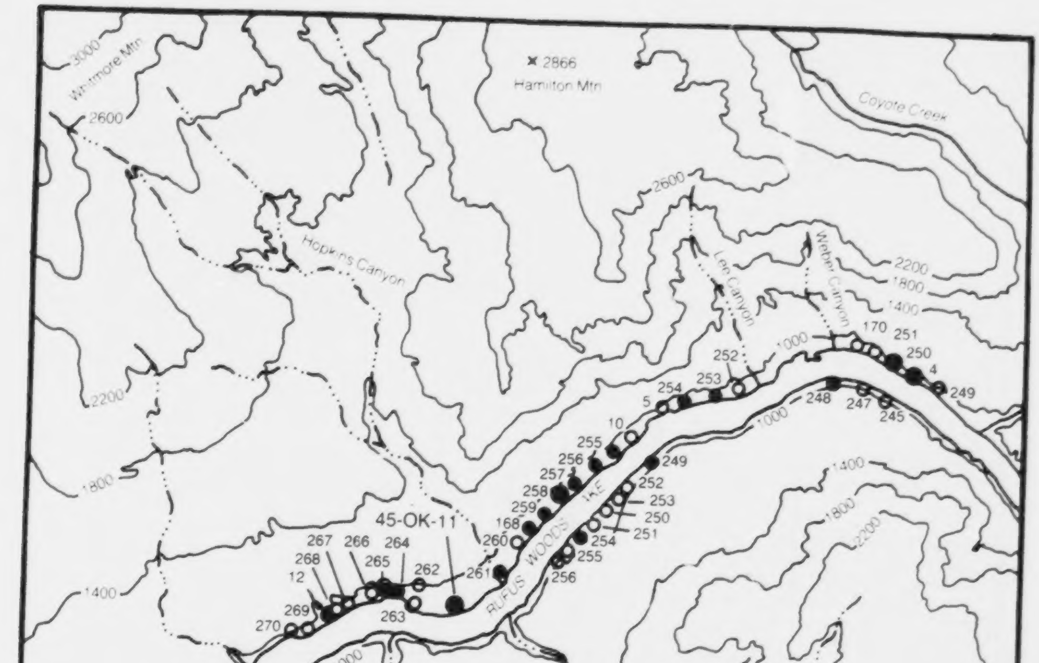

3000
Whitmore Mtn
2600
× 2866
Hamilton Mtn
Coyote Creek
2600
Hopkins Canyon
Lee Canyon
Weber Canyon
2200
1800
1400
1000
2200
1800
1400
45-OK-11
RUFUS WOODS LAKE
China Creek
Twin Springs Canyon
Mah-Kin Rapids
Alameda Flat
Strahl Canyon
Buck Canyon
China Creek
1800
2200
1400
1000
170
251
250
4
249
252
253
254
5
248
247
245
10
255
256
257
258
259
168
260
261
262
263
264
265
266
267
268
12
269
270
271
272
Excavated sites
Tested sites
Identified sites
MILE
0
1
KILOMETER
N

Figure 1-2. Map of site vicinity, showing other excavated, tested, and recorded sites.

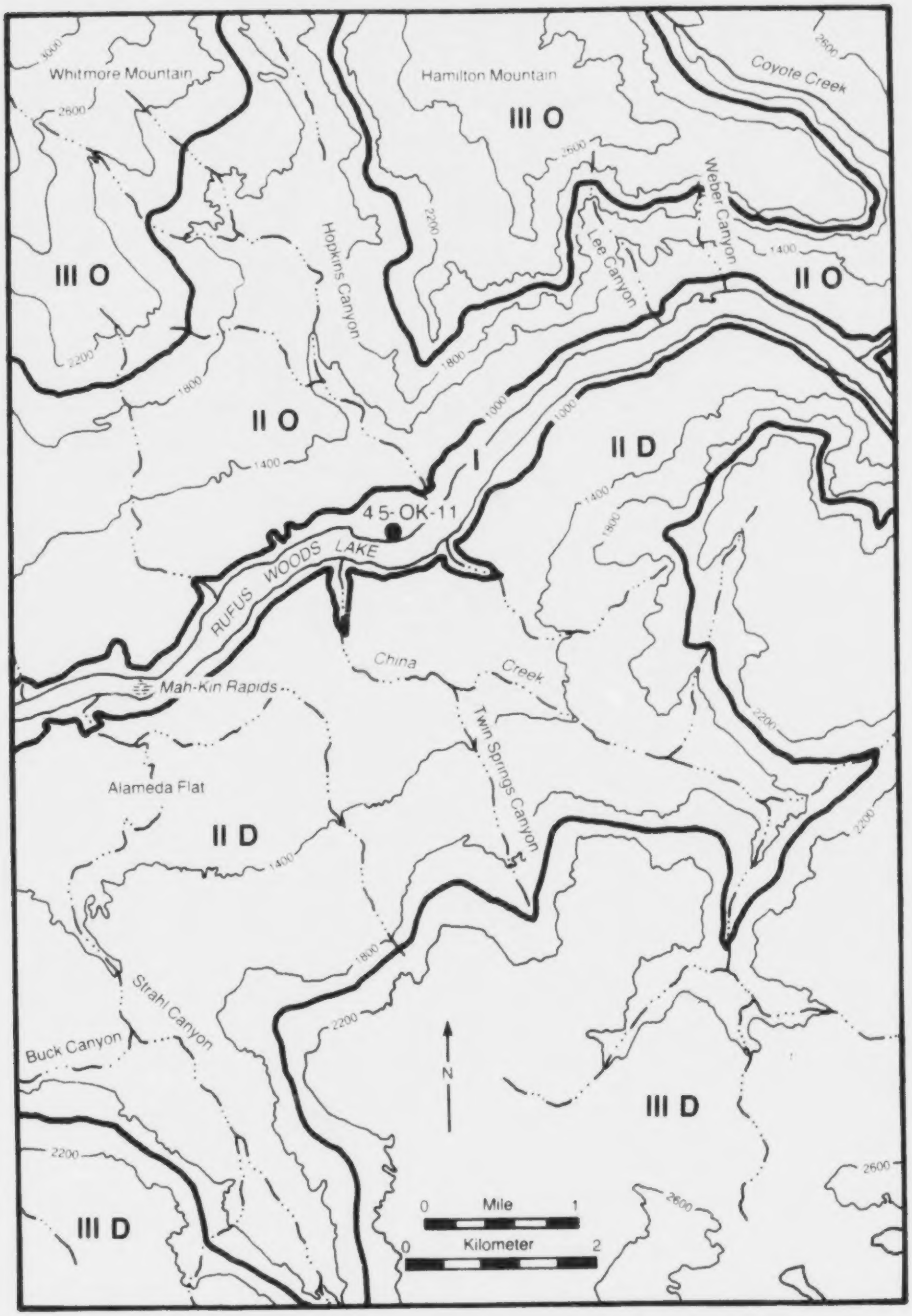

3000
Whitmore Mountain
2600
Hamilton Mountain
III O
Coyote Creek
2600
2600
2200
Hopkins Canyon
Weber Canyon
Lee Canyon
1400
III O
II O
2200
1800
1800
II O
1000
1000
I
II D
1400
1400
1800
45-OK-11
RUFUS WOODS LAKE
China Creek
Mah-Kin Rapids
Twin Springs Canyon
2200
Alameda Flat
II D
1400
2200
1800
Strahl Canyon
Buck Canyon
2200
N
III D
2200
2600
2600
III D
0 Mile 1
0 Kilometer 2

Figure 1-3. Biophysiographic zones in the vicinity of 45-OK-11. (Adapted from Leeds et al. [1981], Daubenmire and Daubenmire [1968], Daubenmire [1970], and Franklin and Dryness [1973]).

BIOPHYSIOGRAPHIC ZONE DESCRIPTIONS

ZONE IR	Floodplain, low glaciolacustrine terraces, current and relict beaches, draws and canyon mouths, alluvial fans, and rivercut bluffs; sagebrush-grass associaton, riparian communities along water sources.
Zone IL	Floodplain, steeper slopes, lower amounts of solar radiation, fewer relict terraces, rockier soils, and more precipitous bluffs; sagebrush-grass association, riparian communities along water sources.
Zone IIR	Upper terraces, steep talus slopes, canyon floors, and steep canyon walls; shrub-steppe and Ponderosa pine characterized by a complex mosaic of alternating dominants, interspersed with a variety of small habitat types associated with draws, canyons, rocky slopes, talus slopes, and standing water.
Zone IIL	Upper terraces, steep talus slopes, canyon floors and steep canyon walls, upper boundary largely coincides with the rim of the basaltic Columbia Plateau, which overlooks the river on the south and west; shrub-steppe, dotted with a variety of small habitat types along draws, canyons, rocky slopes, talus slopes, and standing water.
Zone IIIR/IVR	Dissected tableland with elevations from 600m (1200 ft) to 900 m (3000 ft), with higher rounded massifs above 900m, consists of higher glaciolacustrine terraces, alluvial fans, canyons, and ridge systems, which form the escarpment of the Columbia Canyon; shrub-steppe, pine and Douglas fir/grand fir forests, small islands of riparian growth along seeps and streams.
Zone IIIL	Flat basaltic plateau of poorly developed lithic soils, shallow scabland coulees, low mesas, and numerous pothole lakes, differs from Zone IIIR in being steeper and less dissected, fewer annual aquifers and remnant terraces, and generaly more shadowed from direct sunlight; shrub-steppe, with riparian communities along seeps, streams, and pothole lakes.

A sagebrush-grass association (*Artemisia tridentata-Agropyron*) (Daubenmire 1970), typical of the Upper Sonoran life zone (Piper 1906), characterizes the vegetation in the site area. Introduced plants include cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola kali*), and thistle (*Cirsium* spp.) among others. Scattered sagebrush and rabbitbrush (*Chrysothamnus nauseosus*), and a dense understory of grasses along with an abundance of spring flowers grows on the site. A more mesic association including rose (*Rosa* sp.), serviceberry (*Amelanchier* sp.), horsetail (*Equisetum* spp.), tule (*Scirpus acutus*), and sedges (*Carex* spp.) grows in nearby drainages.

On the upper terraces above the river, *Artemisia rigida* replaces big sagebrush in areas of thinner, rocky soils. Bitterbrush (*Purshia tridentata*) and isolated pines (*Pinus ponderosa*), with an understory of grasses, grow along the steep draws draining the slopes and terraces. To the south, across the river, scattered pines give way to sagebrush covered uplands dotted with small lakes and springs. To the north, mixed Douglas fir (*Pseudotsuga menziesii*) and pine are dominant in moister bottomlands and along streams, where they grow with broadleaf trees and shrubs. At the highest elevations, the fir forest gives way to pine forest, except on north-facing slopes and valley floors, where the dominant species is still Douglas fir with larch (*Larix occidentalis*) and an associated understory of snowberry.

A wide variety of resources from river and land was available to the prehistoric occupants of 45-OK-11. Fresh water was nearby. From adjacent habitats, they could exploit a range of plant species the ethnographic peoples of the area used in the manufacture of utilitarian items--rushes and bark for mats, matting, and baskets, for instance. They could gather edible seeds and roots as well as brush as fuel for fires. Driftwood from the river and the nearby stands of ponderosa provided a ready source of building material and fuel. Year-round, they could hunt small game such as beaver (*Castor canadensis*), hares (*Lepus townsendii*), and marmots (*Marmota flaviventris*), common residents of the general site area. In the winter, when mountain sheep and elk came down from the uplands to forage by the river, they could take larger game. Some deer may have been present year-round. The river, of course, yielded an abundance of fish: four species of salmon--chinook (*Oncorhynchus tschawytscha*), coho (*O. kisutch*), chum (*O. keta*), and humpback (*O. gorbushcha*)--had runs from May through November; sturgeon (*Acipenser transmontanus*) made runs in August. Resident fish would have been available year-round. Waterfowl were present year-round, although during spring and fall migrations and during the breeding seasons in the late spring-early summer their numbers would have been at their peak.

45-OK-11 possessed many qualities which commended it as an ideal site for year-round occupation and, especially, for a winter encampment--its proximity to both the Columbia River and the stream draining Hopkins Canyon, its soft, gently sloping alluvial surface, and its southern exposure. Task groups need not have travelled far to obtain economically important plant or animal species. Indeed, those same qualities which attracted humans to establish a winter occupation there would have also attracted game. Fishing would have been good, although the best salmon fishing would be had at some distance from the site--at shallows and rapids where migrating salmon could be netted or speared in large enough numbers to feed groups over a large part of the year. Whatever the actual emphasis of the prehistoric inhabitants, the location of 45-OK-11 allowed its occupants to exploit a broad range of resources found within a series of habitats on or near the river floodplain.

INVESTIGATIONS AT 45-OK-11

Site 45-OK-11 was selected for investigation by the Chief Joseph Dam Cultural Resources Project because testing in the fall of 1977 had revealed at least two major cultural components dating to two separate cultural periods. Cascade projectile points in the lowest component indicated occupation during RWL Period II (ca. 5500-4500 B.P.). The upper component was radiocarbon dated to RWL Period IV (ca. 3500-2500 B.P.). The earlier component, not well documented elsewhere in the project area, excited considerable interest, and the decision was made to sample 45-OK-11 with an emphasis on the investigation of the older cultural remains.

A crew averaging about twelve to fifteen members, under the direction of a site supervisor and one or two assistants, excavated site 45-OK-11 from August 1, 1978 through December 12, 1978, and again from February 2, 1979 till January 4, 1980.

Excavation was conducted within a stratified random sampling design aimed at sufficient areal coverage to guarantee reliable baseline data about site content and structure. Thirteen sampling strata containing 100 2 x 2-m units were established across the site surface (Figure 1-4). Eight potential units were selected for excavation using a random numbers table (Figure 1-4). Excavation of units proceeded from north to south.

By the end of the first field season, most of the selected eight random units had been excavated in each sampling stratum for the northern half of the site, a total of 58 random 2 x 2-m units in 11 strata. In the second season, it was decided to curtail the selection of more random units because it was assumed that sampling had exposed the deepest and densest part of the site in this first phase of excavation. Only 6 2 x 2-m random units were excavated, bringing the total to 64. Effort then was concentrated on the excavation of purposive units in those areas with deep cultural deposits and stratigraphic evidence of multiple occupations over time.

When excavators exposed a dense bone concentration in sampling Stratum II, they placed seven purposive 2 x 2-m units nearby, intending to expose this activity surface completely (Figure 1-5). Across the ravine to the south, in sampling Strata III and IV, sampling exposed a large, shell-lined houspit. This too was chosen for complete excavation, and, when finished, encompassed an area of 212 m^2 contained in 53 contiguous 2 x 2-m units. Investigation here revealed that an extensive early housepit occupation overlay an even earlier occupation, perhaps predating 5500 B.P. Prehistoric excavations had badly disturbed this older matrix; it was judged to be very poorly defined. Excavators, therefore, sought to locate an area of less intensive housepit

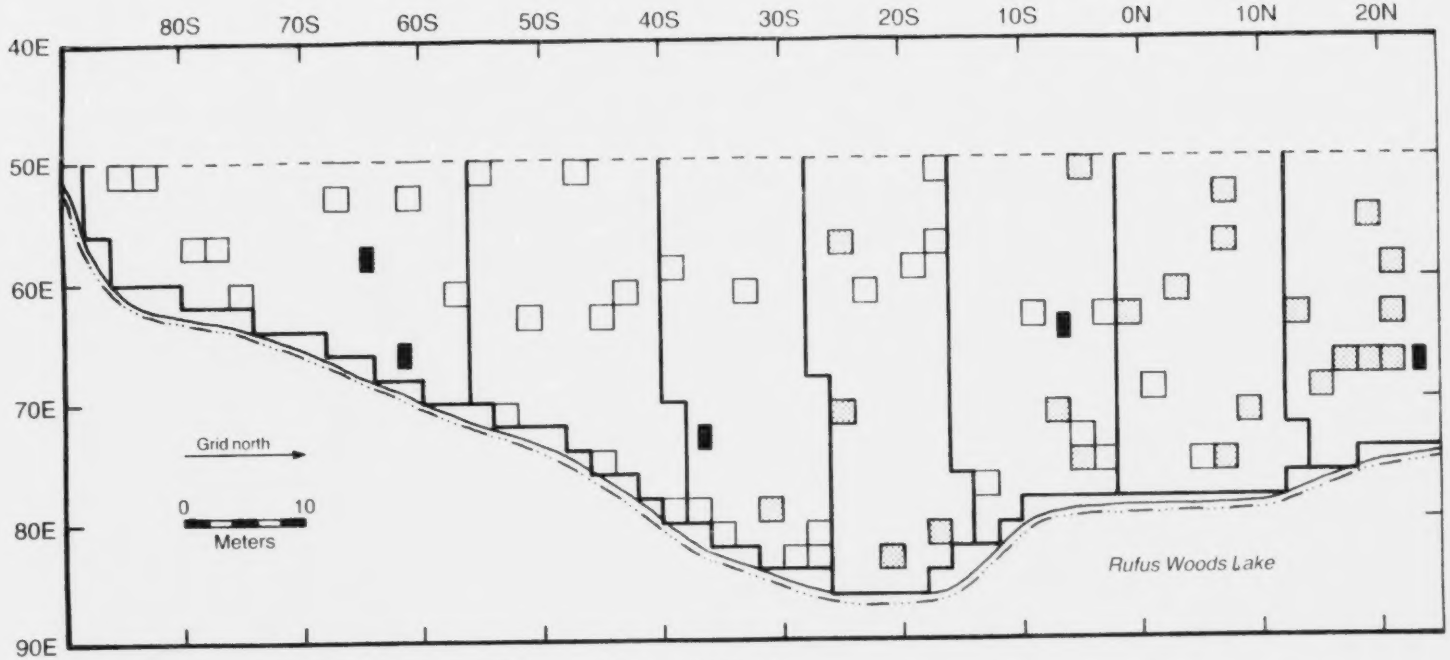

80S
70S
60S
50S
40S
30S
20S
10S
0N
10N
20N
40E
50E
60E
70E
80E
90E
Grid north
0
10
Meters
Rufus Woods Lake

Figure 1-4. Probabilistic sampling design, 45-OK-11.

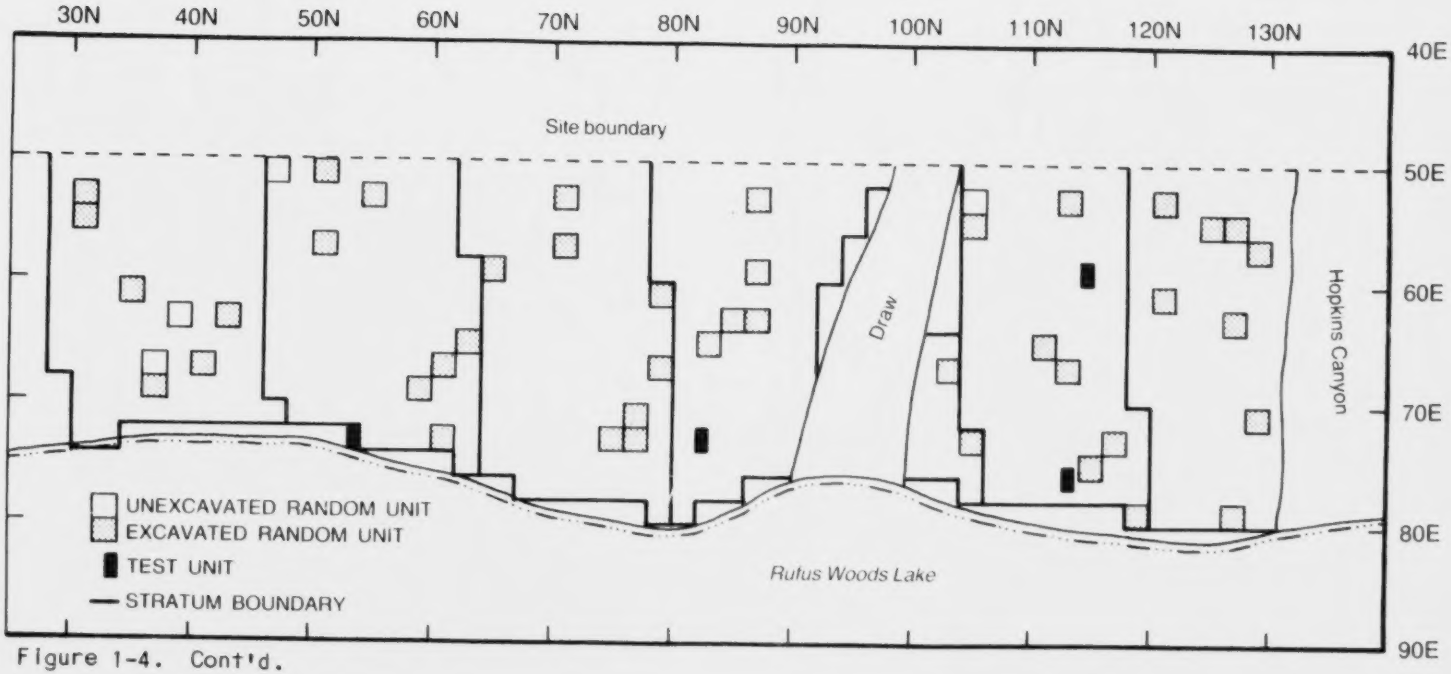

30N
40N
50N
60N
70N
80N
90N
100N
110N
120N
130N
40E
50E
60E
70E
80E
90E
Site boundary
Draw
Hopkins Canyon
Rufus Woods Lake
UNEXCAVATED RANDOM UNIT
EXCAVATED RANDOM UNIT
TEST UNIT
STRATUM BOUNDARY

Figure 1-4. Cont'd.

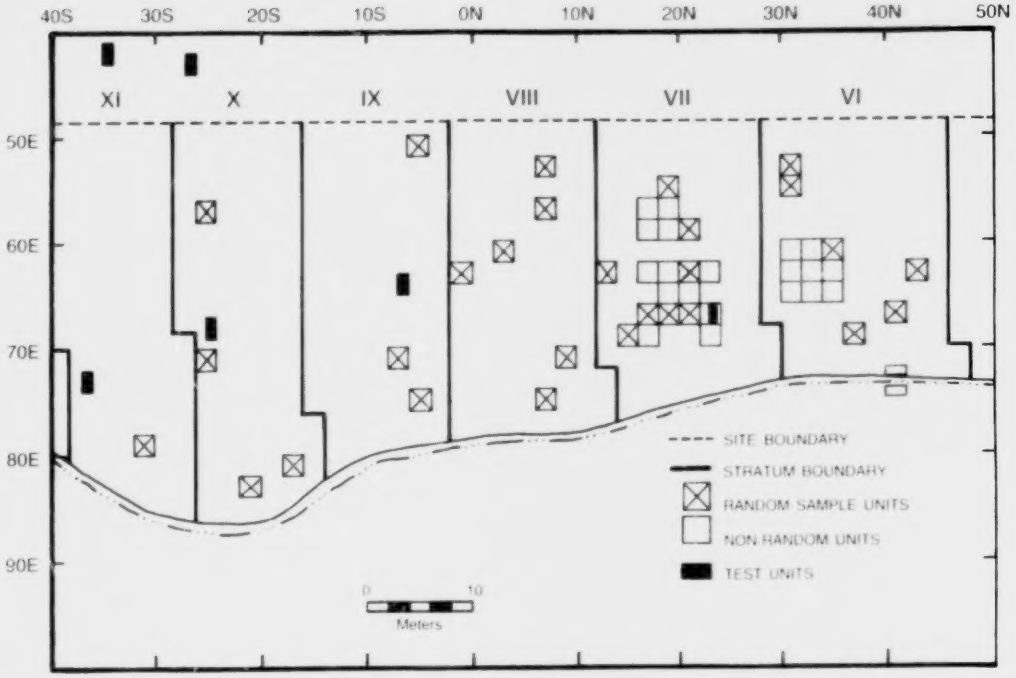


Figure 1-5. Random and purposive units excavated in sampling strata I through XI, 45-OK-11.

construction and shallow overburden. A 4 x 4-m block was opened in sampling Stratum VI, well away from known housepits and the drainage channel bisecting the site. Excavation continued down to the basal cobble layer, but the postulated early component could not be identified. This block did yield, however, a long, uninterrupted stratigraphic sequence invaluable for the interpretation of natural and cultural deposition. In the fall and winter of 1979, other block excavations were undertaken to expose more fully two housepits recognized in sampling as part of the early component.

Excavators designated units by their northwest corner grid points, and subdivided them into 1 x 1-m quadrants, each of which was kept separate. All excavation proceeded in arbitrary 10-cm levels, measured from the northwest corner of each 2 x 2-m unit. When excavators encountered some difference in matrix composition, they recorded this as a feature, profiled or mapped both the feature and the associated artifacts, and bagged materials separately. Excavators used flat-nosed shovels to skim the earth until a cultural feature was identifed; then they removed matrix with trowels. They sifted all material through one-eighth inch screens.

Excavation at 45-OK-11 exposed 204 cultural features, including 11 housepits and the previously mentioned bone scatter. These lie in the lower of two major cultural components defined for the site, and are distributed

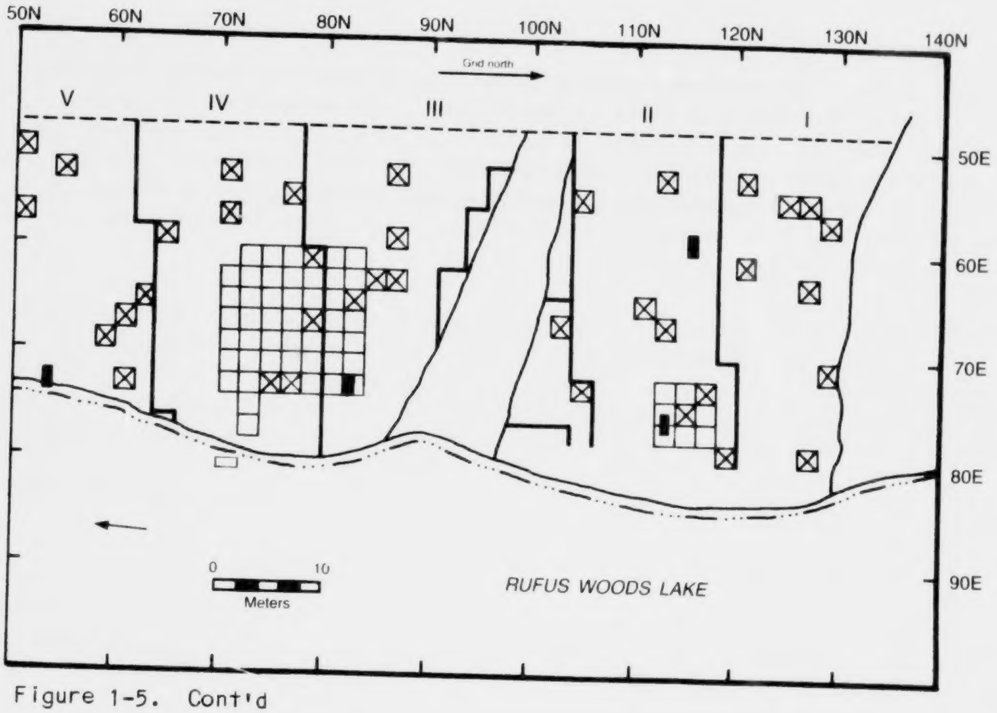


Figure 1-5. Cont'd

over eight analytic areas. A 10.7% areal sample resulted in the removal of 1,020 m^3 of fill, including the largest block excavations opened on any site in the project area. A total of 141 2 x 2-m units (65 random, 74 purposive) and 2 non-random 1 x 1-m units was opened. Twenty-one radiocarbon dates were obtained and several hundred diagnostic artifacts supply chronological control. The artifact assemblage contains 52,650 stone artifacts (including 1,823 which are worn or formed), 295,679 whole and fragmented bones, 205,471 pieces of shell, and 12,372 fire-modified rocks.

REPORT FORMAT

The following chapters present the results of investigations at 45-OK-11. Chapter 2, "Sedimentary Stratigraphy", begins with a discussion of the geologic setting; delineates depositional units, and defines cultural analytic zones in terms of them. Chapter 3 presents the results of three separate analyses--technological, functional, and stylistic--that were applied to recovered artifacts. Chapter 4 describes the faunal remains found at the site; discusses their meaning in terms of subsistence patterns of the site's occupants; and makes inferences from these remains about seasonality. Chapter 5 describes floral remains recovered from the site, and places these in the context of the past economic system, detailing evidence of seasonality where appropriate. Chapter 6 defines cultural zones, discusses the method of features analysis, and describes in detail all structured remains identified at the site. Chapter 7 summarizes the site's cultural and natural deposits, makes inferences from them about the nature and chronology of cultural occupations; and then places these findings in the context of regional prehistory.

2. SEDIMENTARY STRATIGRAPHY AND CHRONOLOGY

This chapter discusses the geologic setting of 45-OK-11 with reference to local geologic history and describes the sedimentary history of the site itself in detail. Strata mapped during excavation are grouped into site-wide depositional units which provide the basis for determining how deposition occurred and for correlating cultural materials between units.

GEOLOGIC SETTING

Site 45-OK-11, just south of the mouth of Hopkins Canyon at RM 576, is in the upper canyon of the project area (Figure 2-1). Here, the Columbia River flows along the eastern margin of the Waterville Plateau where the Columbia River Basalts contact the granitic rocks of the Colville Batholith. The late Quaternary geology is summarized in more detail elsewhere (Hibbert 1984). During the Pleistocene, the middle and northern reaches of the Columbia River drainage were overlain by ice sheets. The Okanogan Lobe of the Cordilleran ice sheet entirely filled the upper canyon to the Grand Coulee, reaching its maximum extent between 13,000 and 14,500 B.P. The ice wasted away earlier in the upper canyon than in the lower canyon. As a consequence, river waters ponded behind the ice dam, and the upper canyon was filled with a thick profile of glaciolacustrine sediments. When the ice dam in the lower canyon was finally breached, the Columbia River rapidly downcut through the lacustrine sediments with occasional stillstands, creating a deep, narrow valley with a prominent terrace system. Mazama tephra Layer O has been observed in alluvial fans built onto the 1,000 ft terrace (Hibbert 1984), indicating that the river reached this elevation before 7000 B.P., and probably reached historic elevations shortly thereafter.

Depositional and erosional processes responsible for altering the landscape since the rapid postglacial downcutting include lateral migration, point bar, and overbank deposition of the Columbia River, alluvial fan development, colluvial deposition, and aeolian deposition. Little floodplain development has taken place in this narrow valley, but natural levees and abandoned channels can be recognized in some areas. Surfaces less than 20 m above the historic river levels commonly exhibit overbank deposits. Local lateral migrations are recorded by the shape of the river, point bar formation, and erosional episodes in site profiles. Alluvial fans have been built on the terraces at the mouths of tributary canyons. Few permanent drainages occur in the project area: most runoff is intermittent and unintegrated. Talus slopes are common at the base of both granitic and basaltic bedrock formations. Erosion and colluvial redeposition of the thick

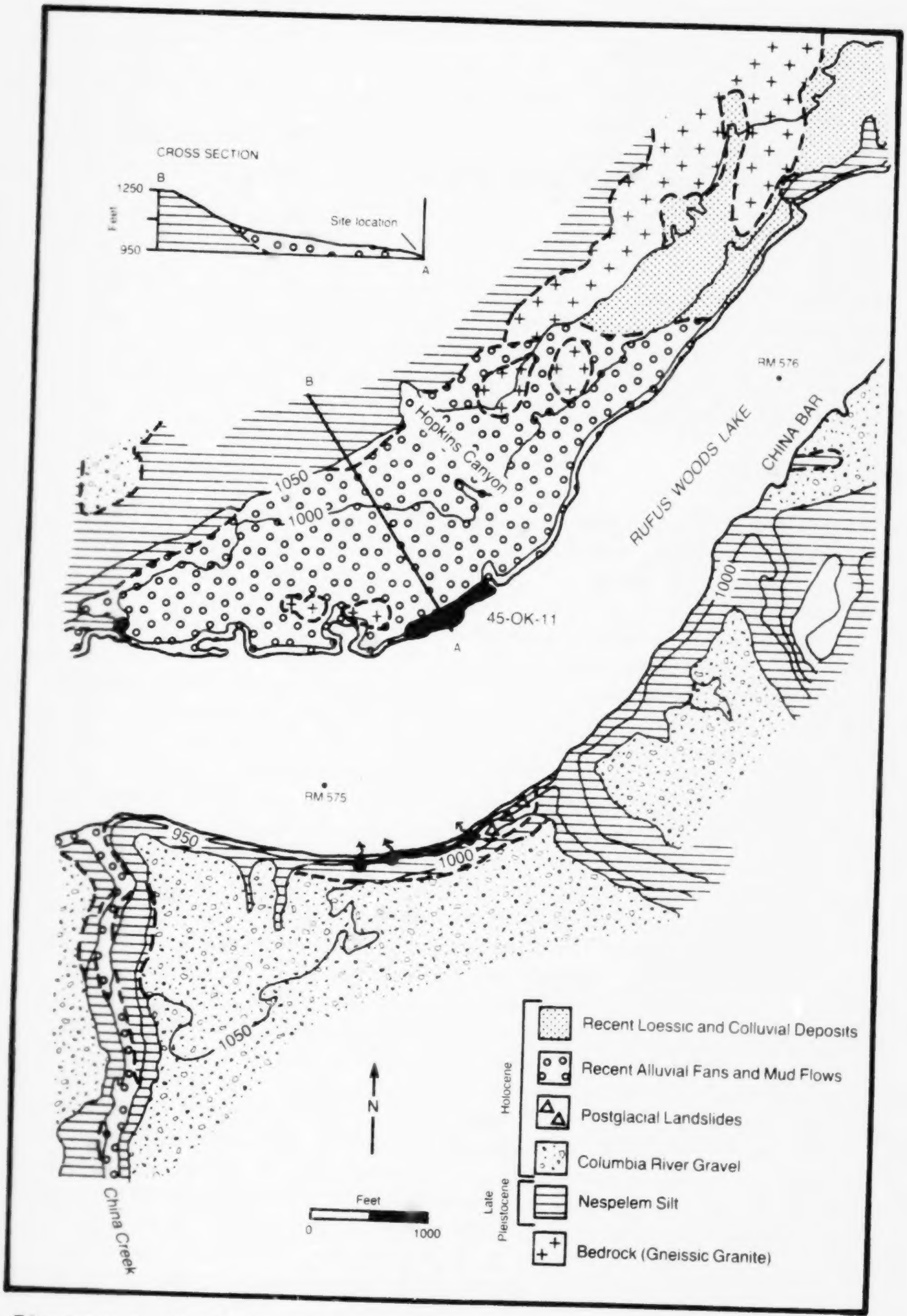

CROSS SECTION
B
1250
Feet
950
Site location
A
B
Hopkins Canyon
1050
1000
45-OK-11
A
RM 576
RUFUS WOODS LAKE
CHINA BAR
1000
RM 575
950
1000
1050
China Creek
N
Feet
0
1000
Holocene
Late Pleistocene
Recent Loessic and Colluvial Deposits
Recent Alluvial Fans and Mud Flows
Postglacial Landslides
Columbia River Gravel
Nespelem Silt
Bedrock (Gneissic Granite)

Figure 2-1. Geologic map of 45-OK-11 vicinity. Adapted from USCE Reservoir Geology Maps, Plates C-17 and C-18.

glaciolacustrine sediments in the upper canyon is common. This may take the form of major landslides or small colluvial and alluvial deposits. Aeolian deposits cover the surface of all but the very youngest landforms.

Site 45-OK-11 is in a geologic sub-region extending several miles along the Okanogan side of the river encompassing sites 45-OK-11, 45-OK-250/4 and 45-OK-258. It is a floodplain that was active throughout most of the Holocene and currently eroding. Floodplains originate by the lateral migration of meanders and by periodic overbank flooding episodes. A typical sedimentary sequence may consist of laterally accreted point bar deposits, accumulated as the river meanders, with a thin layer of overbank-deposited silt and clay capping the point bar material.

The rate of the river's lateral migration controls the amount of vertical sediment accreted (Ritter 1978:306). During early Holocene times, the Columbia apparently migrated quite rapidly and so the floodplain developed mainly by lateral accretion. At 45-OK-11, the evidence suggests that overbank deposition was important in the early stages of profile construction.

PROCEDURES

The random excavation units at 45-OK-11 were excavated and profiled in 1978 before the full-time stratigraphic crew took over profiling and sediment sampling. From early May through December 1979, the stratigraphic crew profiled 298 linear meters of walls from 99 excavation units in the four main block excavation areas (Areas 2,3,4,5/6, Figure 2-2). Wall collapse was a severe problem at 45-OK-11 because of the coarse, sandy matrix. In many areas, entire walls collapsed before they could be profiled. Whenever possible, the slump regions were cut back and new walls, slightly off grid lines, were cleaned and profiled. Additional details of profiling and sediment sampling are found in the discussion of individual blocks later in this chapter. Methods and procedures used in stratigraphic profiling, column sampling, and sediment analysis are described in more detail in the project's research design (Campbell 1984d).

Each block area was profiled separately, that is a unique set of strata was defined and used within each block. Analysis indicates that each block has a distinctive depositional history, but correlations can be drawn to define a site-wide depositional sequence. The units profiled in 1978 were not considered in the analysis.

The stratigraphic boundaries were used as temporal markers to aid in subdividing the cultural deposits for analysis. For the profiled units, the horizontal and vertical distribution of artifacts by quad and level was compared with the natural depositional sequence and feature boundaries. Those stratigraphic units containing a discrete cultural deposit were defined as analytic zones. For a more detailed discussion of procedures used in defining analytic zones, see Campbell (1984d).

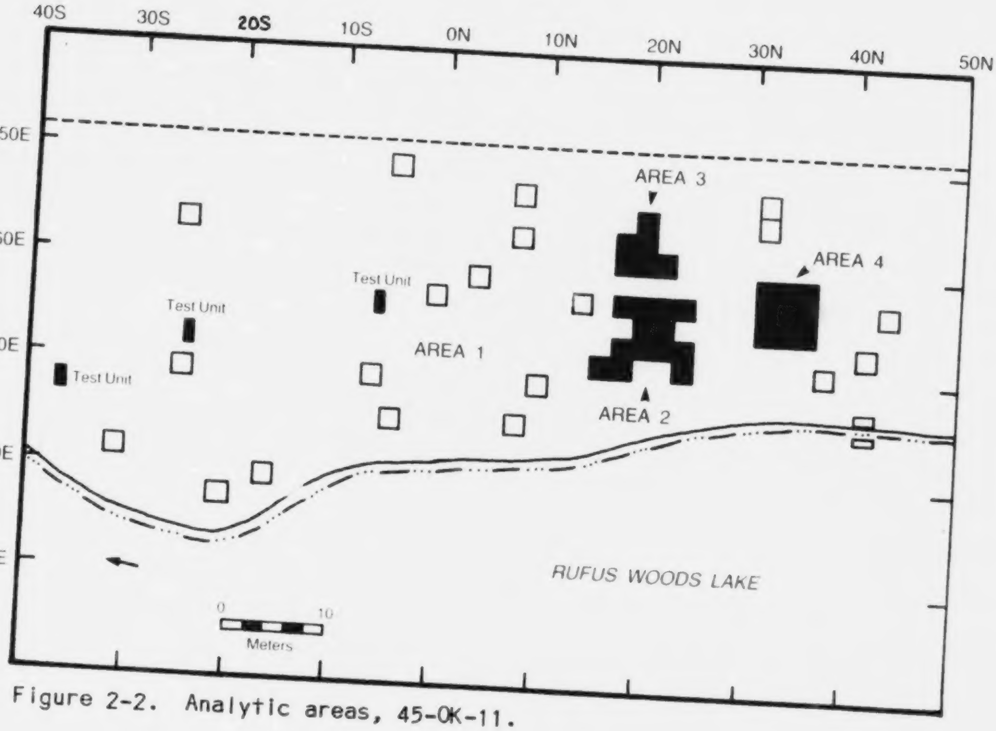


Figure 2-2. Analytic areas, 45-OK-11.

DEPOSITIONAL HISTORY

Site 45-OK-11 is on one of the oldest landforms in the project region that yielded cultural material. The occupants apparently settled there shortly after alluvium started to build on glacial drift. The resulting occupation altered or obscured much of the natural deposition within the excavated block areas. The off-site control unit and several peripheral block units, however, contain a clear record of the natural sediment accumulation for approximately the last 6,000 years. Before that time, the active floodplain probably was unsuitable for occupation.

Despite the stratigraphic complexity of cultural or culturally altered deposits, the natural depositional sequence is fairly straightforward. We have defined six stages and designated each as a depositional unit (Table 2-1). Transects across the site are shown in Figures 2-3 and 2-4.

DU I (Stratum: 400)

The oldest sediment uncovered at this site consists of a cemented, impermeable hardpan of poorly sorted rounded gravel and pebbles in a coarse sand matrix, probably alluvially reworked glacial drift. This carbonate horizon contains more than 40% $CaCo_3$ which cements the deposit. The caliche layer was formed by ground water evaporation in semiarid conditions.

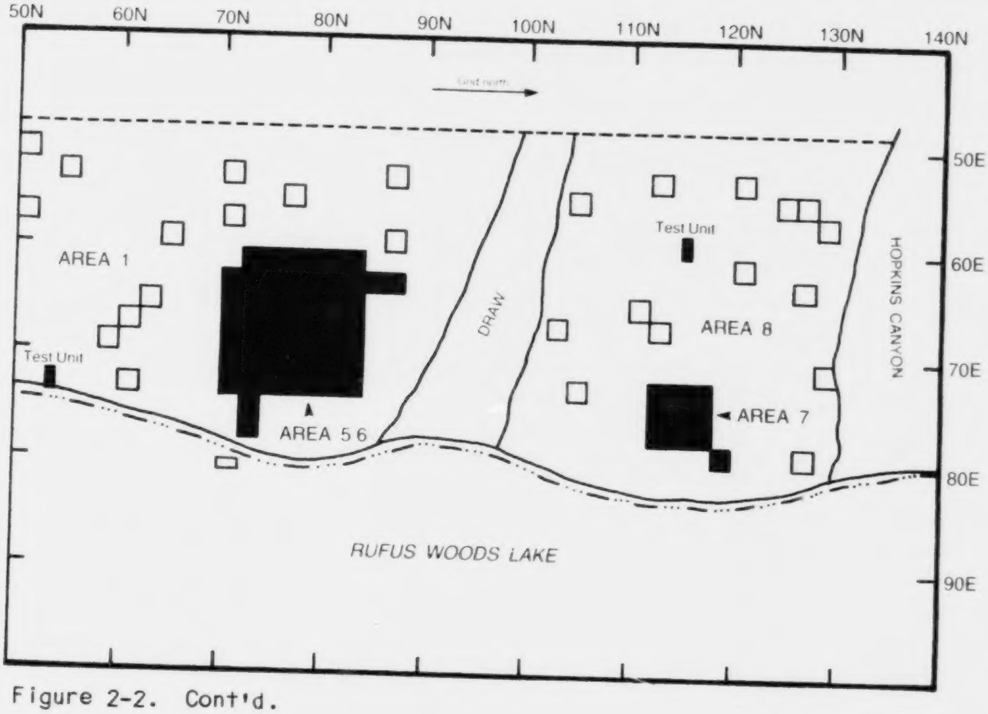

50N
60N
70N
80N
90N
100N
110N
120N
130N
140N
Grid north
50E
60E
70E
80E
90E
AREA 1
Test Unit
AREA 5 6
DRAW
Test Unit
AREA 8
AREA 7
HOPKINS CANYON
RUFUS WOODS LAKE

Figure 2-2. Cont'd.

Carbonate horizons can form at varying depths below the surface, and in varying lengths of time, depending on the concentration of carbonates in the water, the amount of water circulating and the permeability of the substrates. The semiarid conditions responsible for the caliche may have existed during the altithermal period of warm, dry conditions believed to date between 7000 and 5000 B.P. (Antevs 1948). These dates have been corroborated for the Okanogan River Valley by pollen studies showing Artemisia dominance after Mazama ashfall, ending by 4800 B.P. (Mack et al. 1979). However in the San Poil River Valley, the drainage to the east and north of the project area, vegetation indicative of a warmer period persists until 4000 B.P. (Mack et al. 1978). The formation of this caliche deposit may have been accelerated by eluviation of $CaCO_3$ from overlying cultural deposits. Site 45-OK-11 is the only project site at which a basal caliche deposit was observed.

Depositional Unit I is not site-wide. It underlies Housepit 1; but is not found south of grid line 60N. It does, however, form the basal deposit in the off-site control unit 70.5 m west of the primary site datum (approximately 130 m west of Housepit 1). If the hardpan had extended further to the south, it was probably scoured by the river as it meandered before the occupation of the site.

Table 2-1. Combined stratum descriptions, 45-OK-11.

DU	Stratum	Description
VI	100	Brown (10YR5/3 dry) sand to loamy sand, soft, moderately well sorted subangular to subrounded grains, pH 6.3 to 6.9. Includes surface litter layer, sporadic plow zone and underlying aeolian sediments, site-wide. Boundary: abrupt; smooth.
V	125	Grayish brown (10YR5/2) to brown (10YR5/3) loamy sand, pH 6.4 to 7.2. Wind-modified alluvium with a trace of subangular and subrounded gravel. Site-wide stratum, scattered cultural debris. Boundary: gradual; smooth.
IV	150	Grayish brown (10YR5/2) loamy sand, moderately well sorted, slightly firm, scattered shell and charcoal, pH 6.8 to 7.4. Boundary: gradual to clear; smooth.
	151	Grayish brown (10YR5/2) to pale brown (10YR6/3) sandy loam to loamy sand, soft, well to moderately sorted, pH 6.8 to 7.3. Alluvium in housepit depressions. Boundary: gradual to clear; smooth.
	152	Grayish brown (10YR5/2) to pale brown (10YR6/3) sandy loam, slightly firm to firm, pH 6.5 to 7.3. Upper housepit occupation with habitation debris and living floor. Boundary: clear; wavy.
	153	Pale brown (10YR6/3) loam to sandy loam, soft to firm, pH 6.7 to 7.5. Includes alluvium and slackwater bands that separate upper from lower housepit occupations and the fill of Housepit 12 in the southeast corner of Block Area IV. Boundary: clear; smooth to irregular.
	154	Brown (10YR4/3) to light gray (10YR7/2) loamy sand, loose, moderately sorted. Includes rim, occupation fill and living floor of section of Housepit 12. Boundary: clear; irregular.
	155	Light grey (10YR7/2) to grayish brown (10YR5/2) sand to loamy sand, soft, moderately sorted, pH 6.7 to 7.5. Lower housepit occupations with living floor at the center of depressions. In Block Area IV this stratum includes the house rim layer of shell. Boundary: clear to abrupt; wavy to irregular.
	155a	This stratum is the living floor of Housepit 13, Block Area I only.
	156	Grayish brown (10YR5/2) loamy sand, moderately to poorly sorted, soft to firm, pH 6.5 to 7.3. The stratum is the living floor of Housepit 11. Boundary: abrupt; irregular to smooth. Block Area IV only.
	160	Pale brown (10YR6/3) sand to loamy sand, trace of gravel, moderately sorted, loose, pH 6.7 to 7.2. Alluvium that outlines Housepit 4 walls in Block Area III. Boundary: clear; wavy.
	165	This stratum represents the heavy shell lens and cultural debris in Housepits 1 and 12 along grid line 74N. Block Area IV only.
	170	Light grey (10YR7/2) sand, loose, well sorted, pH 7.0 Underlies and is truncated by Housepit 13. Boundary: abrupt; wavy to smooth. Block Area I only.
	175	Light brownish grey (10YR6/2) sand with abundant fine gravel, moderately sorted, loose, carbon staining and bone, pH 7.0. Appears to underlie Housepit 13 but date is contemporary with earlier housepit occupations at the site. Boundary: abrupt; wavy. Block Area I only.
III	200	Graded beds of unconsolidated overbank alluvium (fine to coarse sand) alternating with bands of slackwater sediments (compact loam, light gray [10YR7/2]), pH 6.7 to 7.3. Portions of this stratum and DU are truncated by the housepits. Boundary: clear; smooth.
II	300	Gravel and pebbles in a coarse to medium sand matrix. Predominantly granitic sub-angular pea gravel and subrounded pebbles. Basal channel deposit.
I	400	Very pale brown (10YR7/4) to pale brown (10YR6/3) hardpan (caliche). Poorly sorted gravel and pebbles in a coarse sand matrix with more than 40% CaCO, pH 8.9. May be mixed with cemented glacial drift. Boundary: unknown.

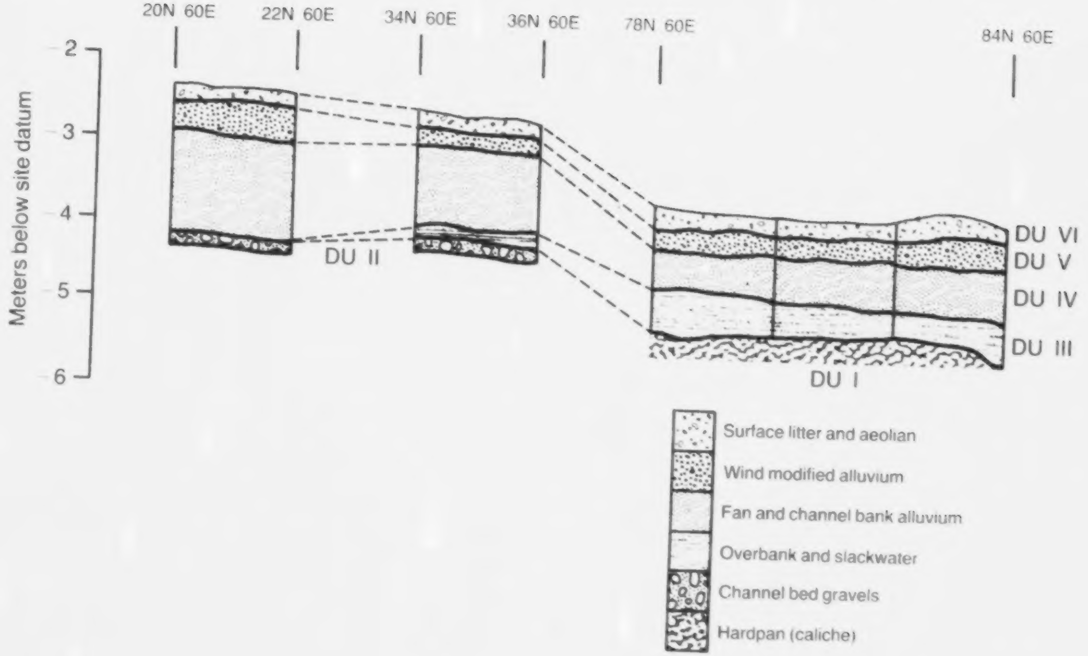

20N 60E
22N 60E
34N 60E
36N 60E
78N 60E
84N 60E
2
3
4
5
6
Meters below site datum
DU II
DU VI
DU V
DU IV
DU III
DU I
Surface litter and aeolian
Wind modified alluvium
Fan and channel bank alluvium
Overbank and slackwater
Channel bed gravels
Hardpan (caliche)

Figure 2-3. North-south stratigraphic transect, 45-OK-11.

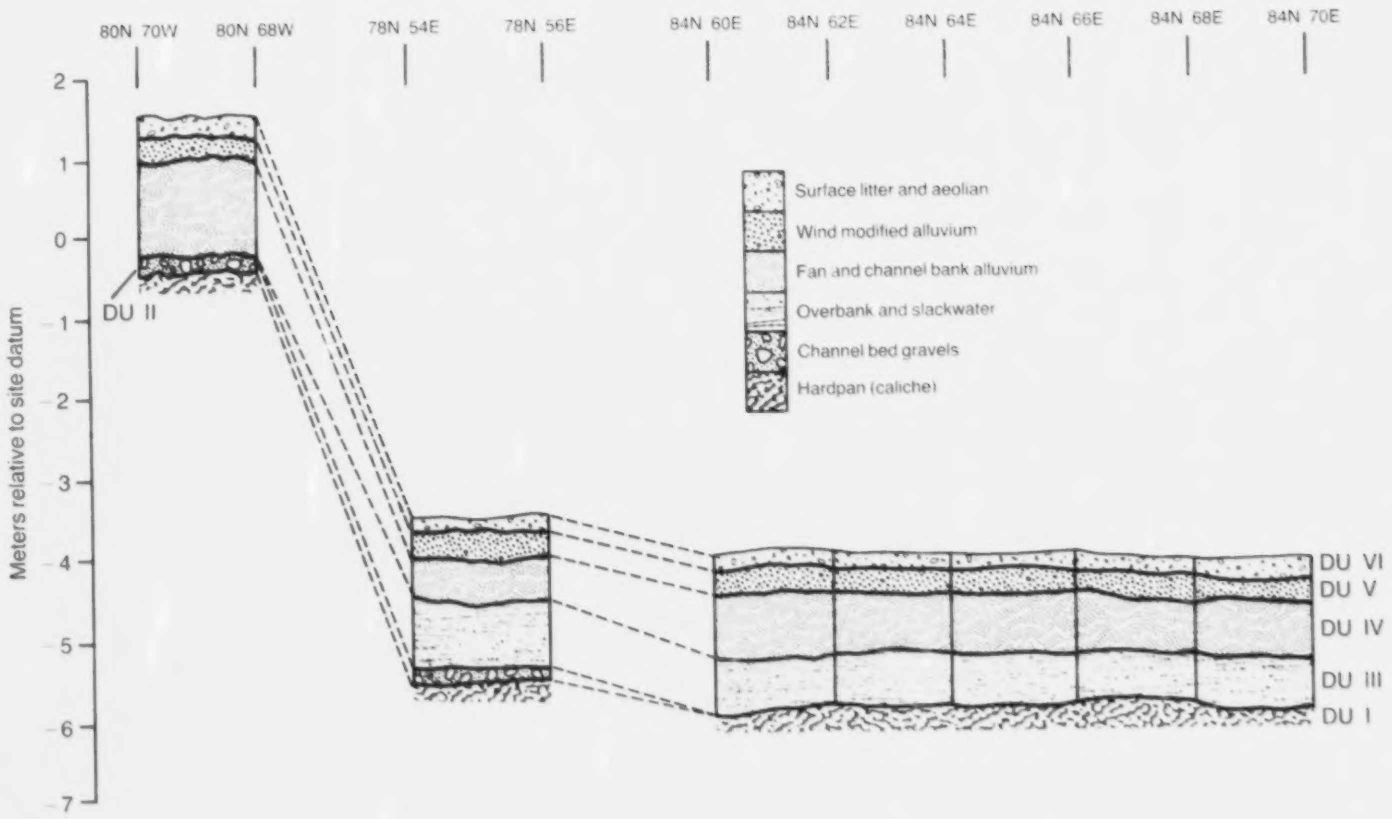

80N 70W
80N 68W
78N 54E
78N 56E
84N 60E
84N 62E
84N 64E
84N 66E
84N 68E
84N 70E
Meters relative to site datum
2
1
0
-1
-2
-3
-4
-5
-6
-7
DU II
Surface litter and aeolian
Wind modified alluvium
Fan and channel bank alluvium
Overbank and slackwater
Channel bed gravels
Hardpan (caliche)
DU VI
DU V
DU IV
DU III
DU I

Figure 2-4. East-west stratigraphic transect, 45-OK-11.

DU II (Stratum: 300)

A channel bed deposit of rounded gravel and pebbles in a coarse sand matrix is the basal sediment in the southern block excavation areas where the hardpan is absent. In the off-site control unit, however, it overlies the hardpan. The channel bed deposit, which extends at least 150 m west of the present river bank, offers evidence of the post-glacial river meander along the flood plain prior to its pre-dam entrenchment. As debris from Hopkins Canyon formed an alluvial fan (DU IV), it may have removed or modified the bed deposit north of grid line 60N within the site boundary.

DU III (Stratum: 200)

Depositional Unit III is represented by overbank alluvium and the associated thin bands of fine-grained compact slack water sediments. The slack water bands were deposited as overbank water retreated leaving shallow ponds. This water evaporated and percolated, leaving behind the silty bands of sediment. Such bands are not in evidence across the entire site, nor were they observed in the off-site control unit. Four bands appear in the main excavation block (Block Area 5/6) and are truncated by Lower Housepit 1. If low levees formed along the shoreline as a result of the overbank episodes, they may have blocked the retreat of water, thus ponding it. Later erosion obliterated evidence of levees. While the Columbia River migrated eastward toward its present channel, it apparently had a primary and secondary bank. As alluvial fan debris (DU IV) built outward, the ponded water on the plain receded, leaving behind alluvium and intermediate slack water bands. Figure 2-5 illustrates the hypothesized landform just prior to occupation.

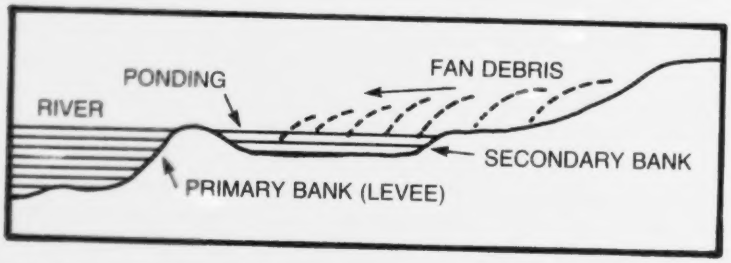


Figure 2-5. Schematic of landforms in Depositional Unit III.

DU IV (Strata: 152-156, 160, 165, 170, 175)

Depositional Unit IV comprises the bulk of the site's sediments. It contains both laterally accreted Columbia River deposits and alluvial fan material. As the channel bank migrated toward its pre-dam entrenchment, alluvium from Hopkins Canyon and ephemeral streams to the south coalesced into an alluvial apron. The larger-grained sediments were deposited closer to the main source (Hopkins Canyon) while the finer sediments were carried further south. The smaller ephemeral streams divided into multiple channels that branched into distributary networks. At 45-OK-11, this network of small streams created a series of micro-drainage basins. This is particularly evident in the 8 x 8-m block excavation (Analytic Area 2). The natural sorting of grain sizes by water and the overlapping of microdrainage basins mixed the sediments deposited by lateral accretion and ephemeral streams. The simultaneous action of two different depositional agents--the Columbia River and runoff from Hopkins Canyon--resulted in a rapid buildup of sediments in the eastern part of the site; in the off-site control unit almost 1.2 meters of DU IV sand and gravel accumulated.

DU V (Strata: 125, 150)

This unit consists of wind-modified alluvium and is transitional, in terms of depositional modes, between DU's IV and VI. It contains the sub-angular grains deposited by gentle slope wash and rain splash as well as the sub-rounded to sub-angular, pitted, fine sand and silt of aeolian sediments.

DU VI (Stratum: 100)

Depositional Unit VI includes the surface litter layer and the underlying stratum of aeolian sediments. The moderately well sorted sandy loam to loamy sand grains are similar in surface attributes to those collected in a wind trap at 45-OK-258. Grasses and rootlets are abundant. A very shallow plow zone appears in some units to site southwest.

SUMMARY

Stratigraphic information collected at 45-OK-11 and in the immediate area supports the following reconstruction of environmental processes and their effects. The Columbia River cut a terrace surface in coarse glacial drift, part of the Nespelem Silt formation. As the river migrated across the terrace, it left channel bed deposits in some areas of the site. The caliche horizon formed at the surface of the relatively impermeable glacial drift deposit at some time after this. We do not know whether the surface was exposed because the river entrenched more deeply, had migrated to the south, or whether the carbonate layer formed seasonally, during low waters when the terrace was exposed. The dry period indicated by the caliche formation may have resulted in greater fluctuations in water level. Erosion may have been greater during this dry period due to a decrease in vegetation; this would result in increased sediment loads in the river, possibly raising the river bed.

From at least 6000 B.P. until 4000 B.P. the river periodically submerged the terrace, leaving a series of graded beds of overbank sediments and at least four associated slack water bands overlying the caliche and the channel bed deposit. Channel bank sediments accumulated on bed deposits as the Columbia River began a series of lateral migrations toward its pre-dam entrenchments. As these laterally accreted sediments were being laid down, alluvial fan debris from Hopkins Canyon and smaller ephemeral streams to the south added new material on the plain. This may have redirected river flow in the southern portion of the site and reworked or removed some overbank evidence. Mottling observed in DU IV indicates the presence of oxidized ferrous iron and a fluctuating water table. Aeolian materials and slope wash debris contined to accumulate from approximately 4000 to 2500 B.P.

Figure 2-6 shows the stages of deposition at the site as well as the postulated redirection of the river as a result of alluvial fan debris.

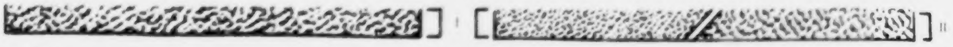
PHYSICAL AND CHEMICAL ANALYSIS OF SAMPLES

Although 15 walls were sampled in a column format, it was neither possible nor necessary to analyze the 232 samples completely. Of major importance in determining the depositional history was the off-site control column. The off-site unit selected by the stratigraphic crew was located 70.5 m west of the primary datum. The crew opened several test holes closer to the site proper, but found cultural material in them. The remaining 14 columns were samples from excavation units which contained light to heavy occupational staining and cultural material. In addition, all 168 level or feature sediment samples collected by the excavators came from culturally altered strata. Physical and chemical analyses of these samples indicates intermittent cultural deposits with properties contrasting with the natural deposits.

Randomly selected samples tested for pH showed a distinction between non-cultural samples and those in heavy occupation levels. Those with high amounts of organic matter, particularly carbon, tended to have lower pH readings than samples from noncultural deposits in similar stratigraphic positions, a trend that extended into the basal caliche stratum.

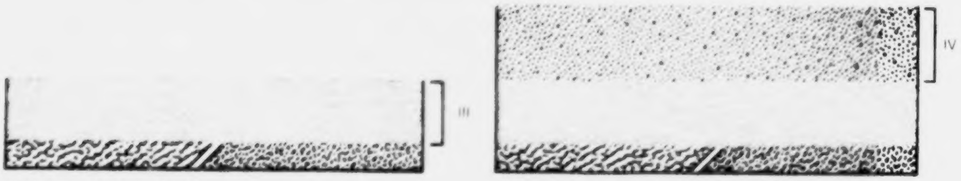
Grain morphology of selected samples examined under the microscope and particle size determinations revealed the transport mechanisms that deposited non-cultural sediments. Aeolian deposits, high in the silt fraction, contained sub-angular to sub-rounded grains with pitted surfaces. Fan debris was more angular, higher in the sand fraction, and had a matte, unpitted surface. The graded beds of Columbia River alluvium had rounded to sub-rounded grains with a glossy surface. Many of the slack water bands at the site were mixed with coarser sediments. One fairly pure sample was obtained from unit 78N65E. Particle-size determination showed 65% sand, 10% silt and 25% clay--a sandy clay loam texture.

The purity of fines in the slackwater sediments can often be determined by chemical analysis. These samples are generally high in calcium and very low in phosphate. Our results are consistent with other studies of similar deposits (e.g., Kelley and Spilsbury 1949). This pattern is prevalent throughout the majority of river deposited samples and is used to postulate the transport mechanism of sediments.



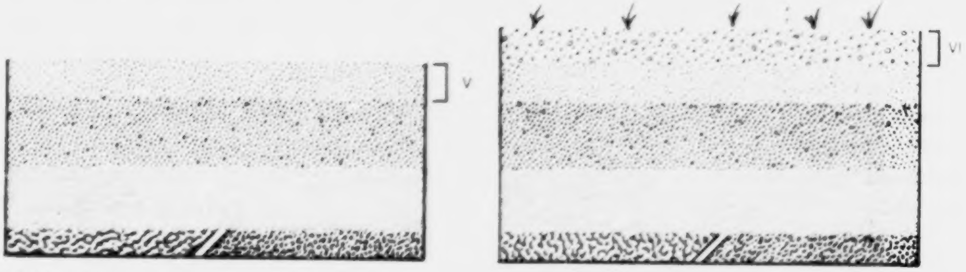
STAGE I: Post-glacial formation of caliche, probably site wide

STAGE II River scours caliche in southern area deposits and channel bed coarse sediments



STAGE III Deposits of overbank alluvium and associated slackwater bands. Some fan debris ~ 7,000 B.P.

STAGE IV Alluvial fan and laterally accreted channel bank sediments. 4-6,000 B.P.



STAGE V Transition layer of wind-modified alluvium

STAGE VI Profile cap of aeolian sediments and organic litter layer

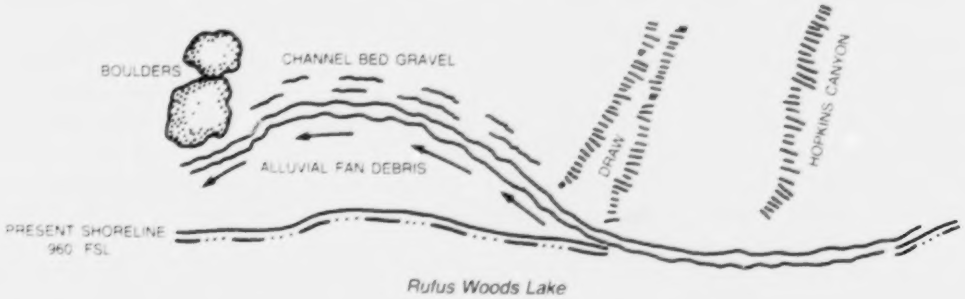

BOULDERS
CHANNEL BED GRAVEL
ALLUVIAL FAN DEBRIS
DRAW
HOPKINS CANYON
PRESENT SHORELINE
960 FSL
Rufus Woods Lake

Figure 2-6. Schematic of depositional sequence, 45-OK-11.

CULTURAL STRATIGRAPHY

To analyze a site's cultural deposits, we must identify a cultural correlate for the natural depositional unit. This may be done during excavation, when artifacts are removed in layers corresponding to perceptible differences in the matrix. Or it may be done later, after the excavation, by correlating artifact and feature distributions with natural strata. We used the second approach here. Because strata in the field were not easily distinguished, excavators employed arbitrary levels referenced to the grid unit and site datums. Cultural materials are tabulated by these 10-5 cm artitrary levels and 1 x 1-m areal units of provenience. We determined analytic zones by correlating artifact frequency distributions with defined cultural and natural features. Radiocarbon dates and diagnostic artifact types were used to check our determinations.

Cultural materials were found throughout the 45-OK-11 deposits with the exception of the cobble layer and calcified cobble layer, Depositional Units I and II. At least one distinct peak of cultural materials is associated with each of Depositional Units III, IV, V, and VI. However, the number of episodes of cultural deposition and construction within each depositional unit varies considerably across the site. Multiple cultural episodes of short duration can be recognized, but can be traced only a short distance horizontally. The spatial variability in prehistoric cultural activities contributes to this problem. For example, structures such as housepits include large cultural assemblages from a relatively short interval of time, and are definable because of the constructed boundaries. They are horizontally limited and cannot be correlated with confidence to equivalent intervals of time outside the housepit, where cultural material accumulated more gradually and clear constructional boundaries are lacking. The situation is further complicated by the horizontal distribution of excavation units; the contiguous units of the block excavations allow recognition of short-term cultural episodes but these cannot be reliably traced between isolated units. Also stratigraphic information was not of uniform detail throughout the site, further limiting the correlations which could be made.

Because of the problems in tracing cultural strata, the site was first divided into horizontal areas characterized by distinctive cultural sequences (Figure 2-2). The block excavation areas, which had the best stratigraphic information, were examined first. Vertically distinct block-wide cultural episodes were designated as zones. Structures also were given separate zone designations to simplify computer retrieval of these assemblages. Stratigraphic information, projectile point data, and radiocarbon dates were used to draw correlations among the blocks. The DU IV/V boundary could be traced across the entire site, resulting in two site-wide zones. The cultural deposits in each zone were distinct in terms of content, thus making it possible to define them in the two areas lacking detailed stratigraphic information (Areas 1, 7/8). The two site-wide zones provide a simple analytic structure which incorporates virtually all of the recovered materials, while the area-zones allow examination of finer sequences of cultural activities in specific areas.

The association of zones into two major occupation components is shown in Figure 2-7, and the contents, recovery, depositional association and ages of the two components are shown in Table 2-2. The older occupation, a Kartar Phase component, is found in the overbank and alluvial fan deposits of Depositional Units III and IV. Radiocarbon dates associated with these materials range between 4200 and 5400 B.P. The pre-housepit occupational materials associated with DU III have been separated in some areas and might usefully be segregated for a more detailed examination. The younger occupation, a Hudnut Phase component with dates of 2800 and 3800 B.P., is associated with the overlying aeolian and wind-modified alluvial sediments of Depositional Units V and VI. The occupation in DU V is well defined and constitutes the bulk of the component. A cultural deposit of lower density and lacking features in DU VI could be separated in those areas with good stratigraphic data. The few projectile points associated with this uppermost deposit did not indicate that it differed substantially in age from DU V.

A clear boundary between the upper and lower cultural component was apparent in all excavation areas except Areas 2 and 5 (Figure 2-7). In both of the latter instances, an analytic zone was seen as transitional (Analytic Zone 23 and Analytic Zone 53), with no separation in artifact frequency distribution or cultural feature distribution. Yet even in Analytic Zone 53, an evident change in diagnostic artifact types occurs in less than 20 cm of cultural deposit.

ANALYTIC AREAS

Eight analytic areas were defined for 45-OK-11, six corresponding to block excavations, and two incorporating isolated units. The natural and cultural depositional history of each area is discussed below.

AREA 1

Area 1 encompasses the isolated units south of the gully (Figure 2-2). The depth of cultural materials ranges from approximately one to three meters; both depth and frequency of cultural materials decrease toward the south and east. Lack of detailed stratigraphic profiles dictated that correlations among units be very general. Combined information on sediments from field notes, radiocarbon dates, projectile points, features, and tabulations of kinds of cultural materials indicates a pattern of cultural deposition similar to the two major cultural occupations in areas of the site with good stratigraphic control.

Zones 1 and 2 are summarized in Table 2-3. The lower occupation, Zone 2, is associated with loose, coarse sands like those which characterize DUs III and IV in other parts of the site. Radiocarbon dates indicate that the deposits span a period of at least 1,500 years, from 4000 to 5500 B.P. The occurrence of two stratigraphically distinct shell lenses in several units, and complex sequences of cultural features in units excavated in Housepits 2, 3, 5, 6, and 9 indicate that finer distinctions are possible. The upper stratigraphic boundary of this zone coincides with a minimum in the frequency

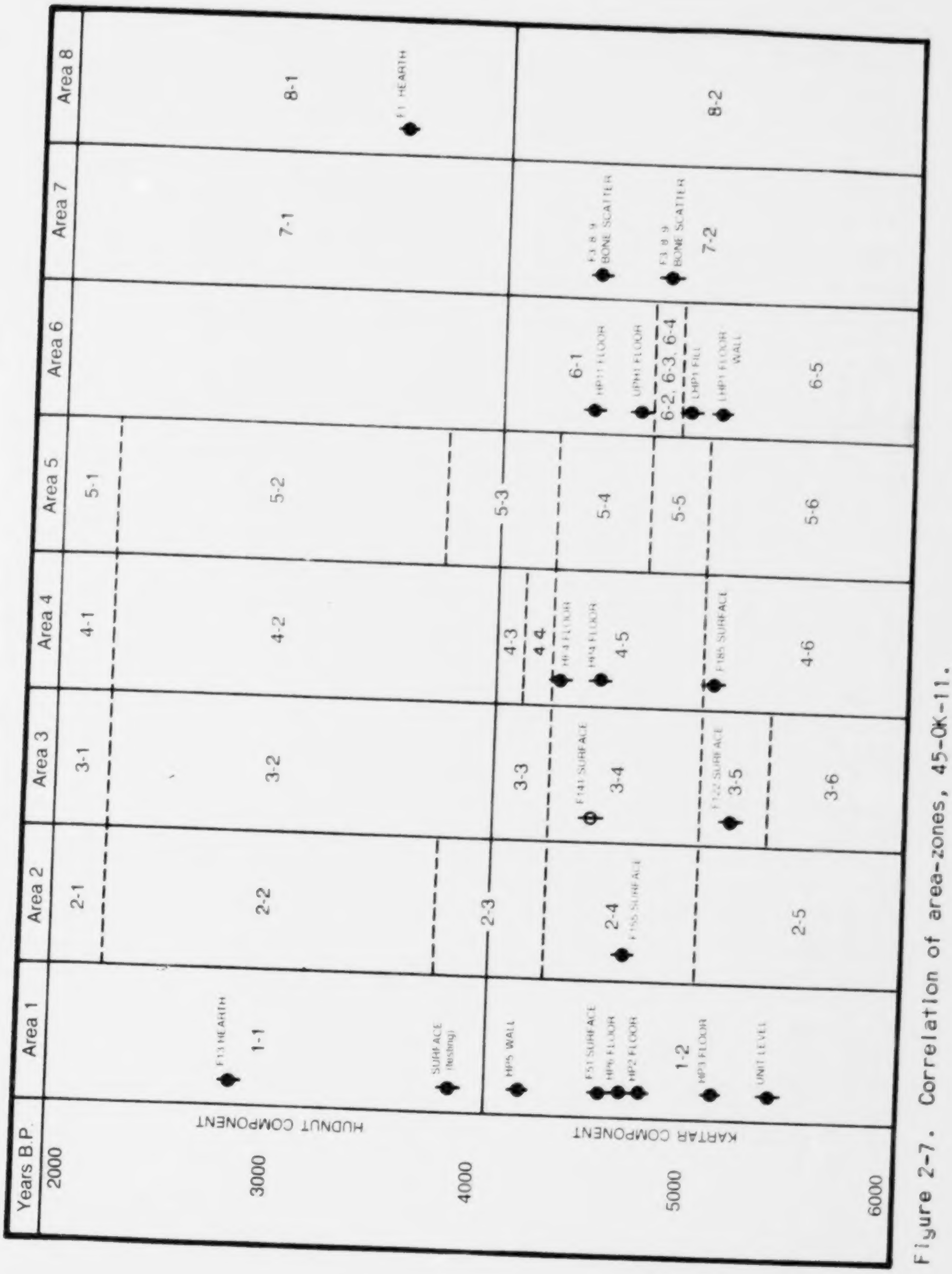


Figure 2-7. Correlation of area-zones, 45-OK-11.

Table 2-2. Summary of sitewide components, 45-OK-11.

Component	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m³)	Density Objects (m³)
Hudnut	V VI	–	Wind-modified alluvium and aeolian deposits	2800-3900	24,706	240	90,979 26,138	19,927 382,295	5,407 951,765	97	141,356	33	350.3	403.5
Karter	IV III	–	Overbank and alluvial fan deposits	4200-5400	26,970	447	203,567 71,935	185,431 571,822	6,942 861,192	157	423,614	143	579.3	731.2
Unzoned	–	–	–		132		1,033	113	23	1	1,302	?	91.1	14.3

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

Table 2-3. Summary of cultural analytic zones, Area 1, 45-OK-11.

Component	Zone	DU	Stratum	Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m³)	Density Objects (m³)
Hudnut	1	–	–	Compact silty sand	2800±130 3557±523	4,334	31	20,377 5,157	5,540 25,889	1,694 266,543	18	31,994	5	102.4	312.4
Karter	2	–	–	Looser, coarser, less silty sand	4187±208 4680±165 4757±157 4872±142 5108±104 5401±343	2,886	80	34,173 13,834	56,022 340,400	1,425 216,137	25	94,611	28	148.3	638.0

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

of cultural materials. Zone 1 comprises the overlying deposits, silty and compact sands. Generally 50 to 70 cm in thickness, they may be as deep as 100 cm above a buried structure. The associated peak of cultural materials is characterized by large numbers of fire-modified rocks, scattered on surfaces or in hearths.

AREA 2

An 8 x 8-m block, Analytic Area 2 lies between 16N-24N and 62E-70E (Figure 2-2). While not all of the units within this block were excavated, the profile record includes the walls from a 1977 test unit and a 1978 sample unit which were reopened in 1979 (Figure 2-8). In all, 38 linear meters were profiled in Block Area 2, but only the two test units were profiled from the surface. Following the stratigraphic mapping of these two units, approximately 1.5 meters of sediment was removed from the surface by backhoe. Thus, the remaining excavation units reflect only the lower 1.3 to 1.5 meters of the sedimentary profile. Figure 2-8 illustrates a section of the lower half of the block excavation between 20-24 N and 62-68E. Five cultural zones were defined in Area 2 (Table 2-4); however, parts or all of Zones 1, 2, and 3 were missng in the units excavated after bulldozing.

A culturally sterile cobble and gravel layer (DU II) underlies the block. This pre-6000 year B.P. channel bed deposit of gravel and fine pebbles is evidence of the meandering pattern of the Columbia River prior to occupation of the floodplain. The area's oldest cultural materials (Zone 5) occur in the overbank sediments of DU III. This deposit held few cultural materials and yielded no features. The densest cultural occupation (Zone 4) occurs in Stratum 155, DU IV. It is a unique type of deposit at the site, consisting of numerous overlapping lenses, varying in thickness, distinctiveness, uniformity, and horizontal extent. Most of the lenses are darkly stained and contain large amounts of cultural debris and so are judged cultural in origin. There are also naturally deposited lenses but no single surface could be traced across the entire block. A radiocarbon date of 4770±412 B.P. (B-4294) was obtained from one of the cultural features. The upper strata of DU IV are assigned to Zone 3. Removed by bulldozer in most of the units, these massive strata reveal little evidence of cultural deposition. The overlying wind-modified alluvial sediments of DU V were defined as Zone 2. The associated peak of cultural materials is characterized by relatively high proportions of lithics and FMR, and low proportions of shell in comparison to underlying zones. One feature was recorded in the field. A radiocarbon date of 3872±412 B.P. (TX-3059) was obtained from this zone in test unit 24N67E. The youngest sediments are the aeolian materials of DU VI, which contain a few cultural materials, but no features (Zone 1).

AREA 3

The small block excavation north of Area 2 was designated as Area 3 (Figure 2-2). The entire eastern wall along grid line 60E collapsed and was cut back for profiling (Figure 2-9). Twenty-four linear meters, encompassing

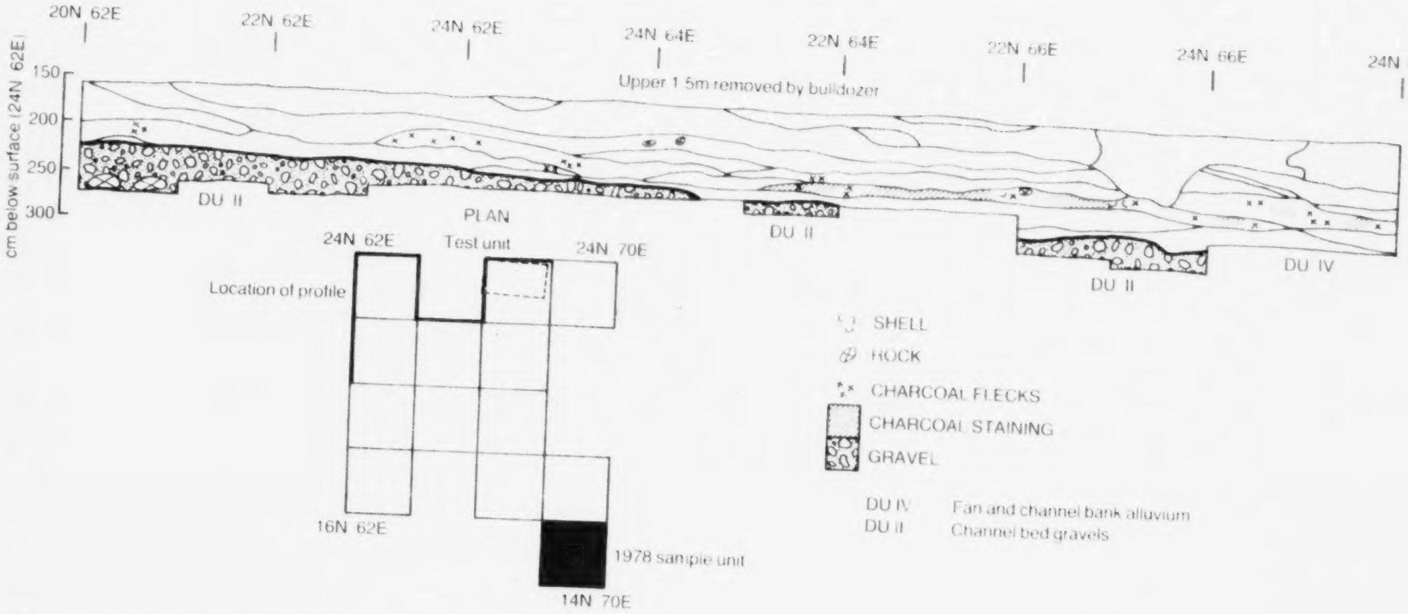

20N 62E
22N 62E
24N 62E
24N 64E
22N 64E
22N 66E
24N 66E
24N 68E
Upper 1.5m removed by bulldozer
cm below surface (24N 62E)
150
200
250
300
DU II
DU II
DU II
DU IV
PLAN
Test unit
24N 62E
24N 70E
Location of profile
16N 62E
1978 sample unit
14N 70E
SHELL
ROCK
CHARCOAL FLECKS
CHARCOAL STAINING
GRAVEL
DU IV Fan and channel bank alluvium
DU II Channel bed gravels

Figure 2-8. Stratigraphic profile, Area 2, 45-OK-11.

Table 2-4. Summary of cultural analytic zones, Area 2, 45-OK-11.

Component	Zone	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m^3)	Density Objects (m^3)
Hudnut	1	VI	100	Aeolian deposit and surface litter mat	-	756	6	461 97	20 86	-	-	1,257	1	8.6	146.6
	2	V	125	Wind-modified alluvium	-	1,798	5	1,249 221	51 161	227 26,237	-	3,330	1	8.5	391.8
Karter	3	IV	151,153	Massive channel bank and alluvial fan deposit	-	1,627	34	2,511 598	879 6,192	158 18,413	1	5,210	1	9.7	537.1
	4	IV	155	Massive channel bank and alluvial fan deposit	-	1,121	13	2,578 841	1,247 8,299	253 35,518	7	5,220	1	9.6	543.7
	5	IV	155a	Massive channel bank and alluvial fan deposit	5171±151	3,233	10	2,804 2,838	1,668 11,011	132 21,461	2	7,847	6	8.7	902.0
	6	III	170,175	Overbank deposit	4409±137	412	3	2,180	758	48	5	3,404	1	5.9	577.0

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

Table 2-5. Summary of cultural analytic zones, Area 3, 45-OK-11.

Component	Zone	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m^3)	Density Objects (m^3)
Hudnut	1	VI	100	Aeolian deposit and surface litter mat	-	375	9	587 73	2 10	14 1,613	2	983	-	3.8	258.7
	2	V	125	Wind-modified	3872±412	810	14	3,003	14	445	2	4,288	1	6.0	714.7
Karter	3	IV	151,153	Massive channel bank and alluvial fan deposit	-	228	1	2,661 543	417 2,496	15 1,002	-	3,317	-	8.6	385.7
	4	IV	155	Massive channel band and alluvial fan deposit	4470±150	1,932	25	36,105 13,763	13,231 56,919	737 123,465	3	51,033	29	38.3	1,332.5
	5	III	180	Overband deposit	-	379	2	2,111	302	24	-	2,818	-	16.3	172.9

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field recorded features.

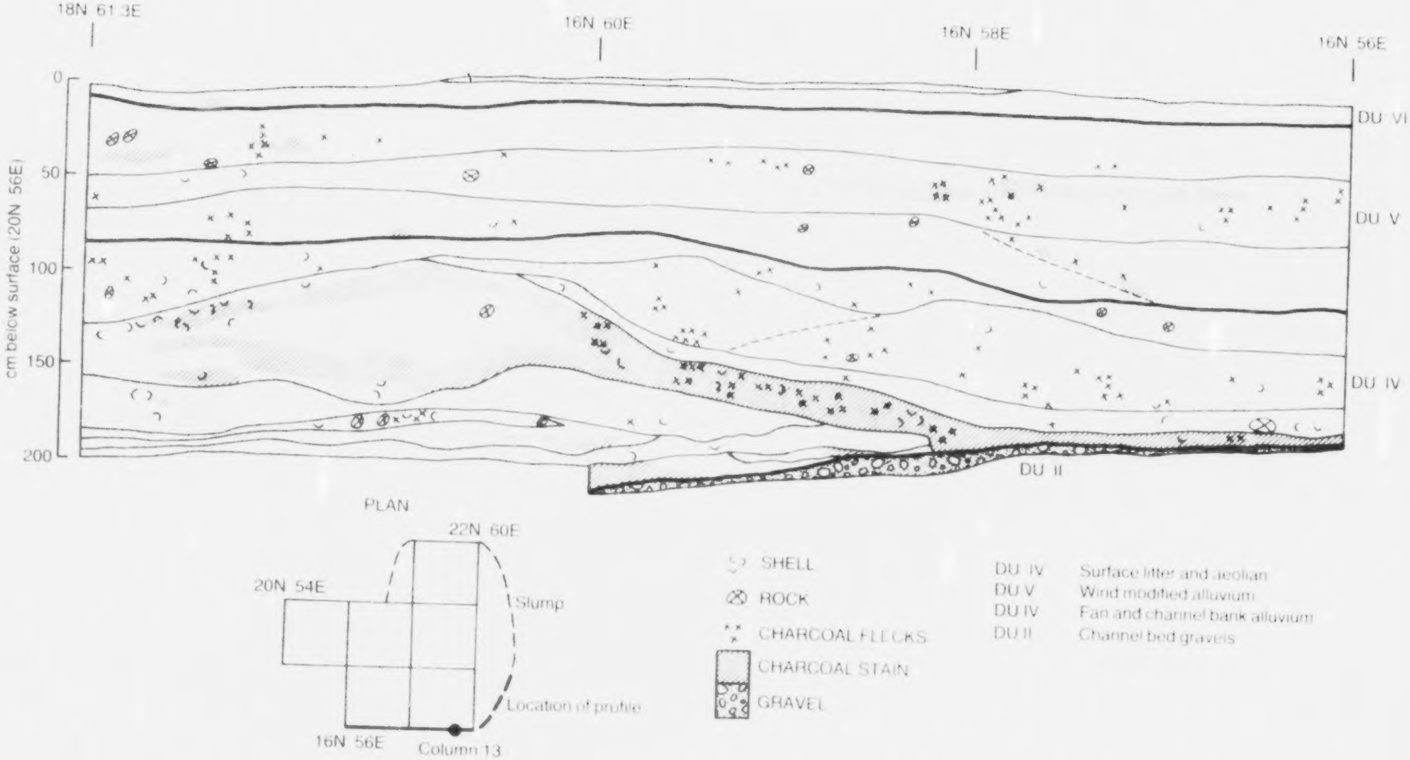

18N 61.3E
16N 60E
16N 58E
16N 56E
cm below surface (20N 56E)
0
50
100
150
200
DU VI
DU V
DU IV
DU II
PLAN
22N 60E
20N 54E
Slump
Location of profile
16N 56E
Column 13
SHELL
ROCK
CHARCOAL FLECKS
CHARCOAL STAIN
GRAVEL
DU IV Surface litter and aeolian
DU V Wind modified alluvium
DU IV Fan and channel bank alluvium
DU II Channel bed gravels

Figure 2-9. Stratigraphic profile, Area 3, 45-OK-11.

the block circumference, were profiled. Figure 2-9 shows a portion of the block profile walls between 16N56E and 18N61.3E. Sediment samples from one column on the southern wall of excavation unit 18N58E were collected and analyzed. Six cultural analytic zones were defined (Table 2-5).

The oldest cultural materials are associated with the overbank deposits of DU III. A diffuse midden and probable occupation surface is in evidence. Thin, broken bands of fine-grained sediments, interpreted as slack water sediments, overlie the occupation surface. One of the earliest radiocarbon age estimates (5171±151 B.P., B-4292) at the site came from a charcoal sample collected from the occupation surface. Two cultural zones occur in the overlying channel bank and alluvial fan deposits of DU IV. The lower deposit, Zone 5, the densest occupational stratum in the block, has the greatest number of features. The inversion of radiocarbon dates between Zones 5 and 6 is considered in Chapter 6. Strata 151/153 (DU V) also contains a peak of cultural materials and is defined as Zone 3. Stratum 125, also in DU V, contains a distinct peak of cultural materials and is defined as Zone 2. Zone 1 corresponds to the aeolian materials of DU VI. Cultural materials are sparse in this zone and no features were recorded. Zones 1 and 2 are characterized by relatively higher proportions of lithics and FMR and lower proportions of shell is comparison with the four older zones.

AREA 4

Analytic Area 4 (Figure 2-2) contains Housepit 4. All walls within the block were profiled as well as an extended 1 x 2-m unit at its southeast corner. A massive slump occurred along the east and south perimeter walls (grid line 30N and 66E). The stratigraphy crew cut these walls back as much as 75 cm to facilitate profile mapping (Figure 2-10). The crew profiled 52 linear meters in all, encompassing the entire housepit floor and most of its outer rim. Figure 2-10 shows a section of the house rim and living floor between 30N-63E and 33N-66E. Two columns were sampled and analyzed. The six zones defined in this area include block-wide stratigraphically defined zones as well as structural features (Table 2-6).

River channel bed gravel, an extension of the basal stratum in Area 2, underlies culturally deposited debris throughout the block. Zone 6 corresponds to the overbank deposits of DU III, which contains a pre-housepit occupation. A radiocarbon date of 5085±168 B.P. (B-4295) was obtained from a living surface in this zone. The sediments of DU IV contain two separate zones. Zone 5 includes the floor and wall of the housepit, which is cut into Stratum 160. The floor has been dated at 4564±150 (B-4296). The gently sloping walls extend nearly to the edge of the block and no contemporaneous occupation was recognized outside the structure. Zone 4 is the fill of the housepit. Although cultural materials are relatively rare in comparison with the house floor, one hearth feature, which yielded a radiocarbon date of 4200±180 B.P. (TX-3381), indicates direct use of the depression. At least three separate slackwater bands are recorded: one laid down before occupation and the other two after the housepit was abandoned. Zone 3, corresponding to Stratum 150, extends across the entire block. Cultural materials are

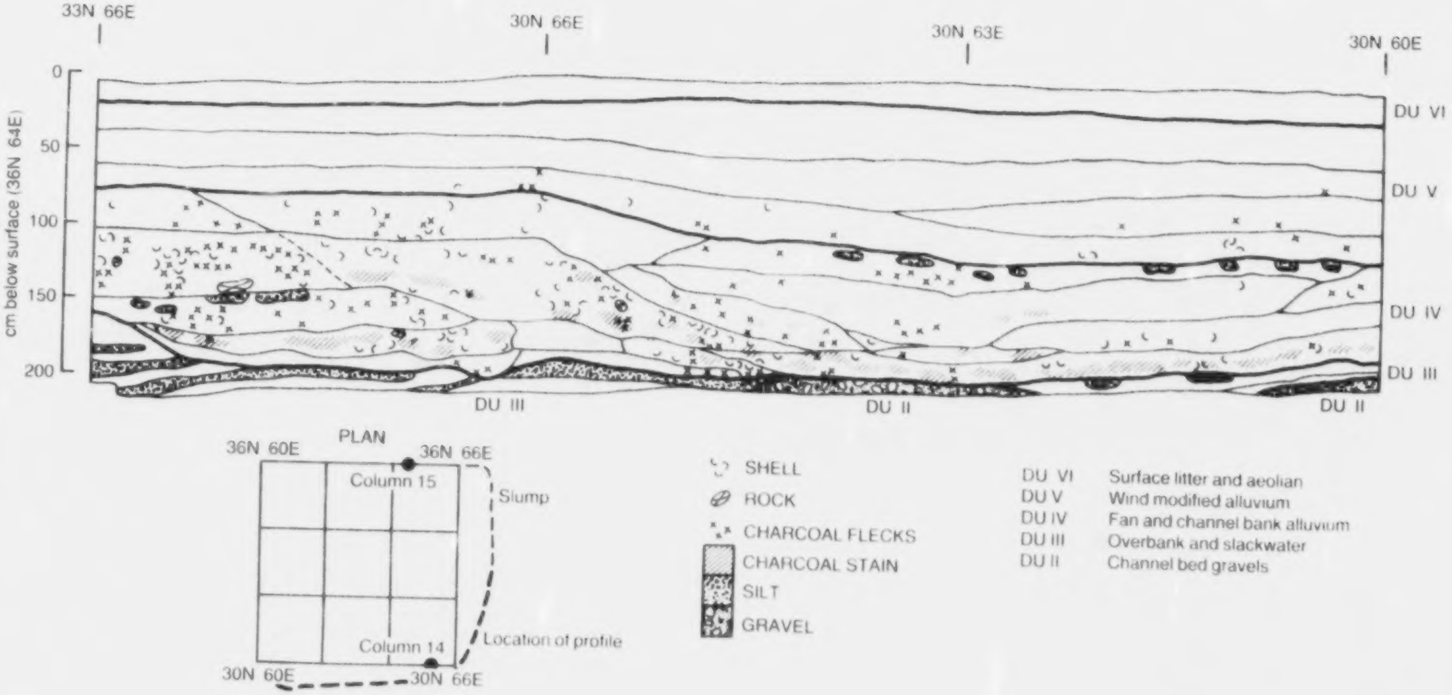

33N 66E
30N 66E
30N 63E
30N 60E
cm below surface (36N 64E)
0
50
100
150
200
DU VI
DU V
DU IV
DU III
DU III
DU II
DU II
PLAN
36N 60E
36N 66E
Column 15
Slump
Column 14
Location of profile
30N 60E
30N 66E
SHELL
ROCK
CHARCOAL FLECKS
CHARCOAL STAIN
SILT
GRAVEL
DU VI Surface litter and aeolian
DU V Wind modified alluvium
DU IV Fan and channel bank alluvium
DU III Overbank and slackwater
DU II Channel bed gravels

Figure 2-10. Stratigraphic profile, Area 4, 45-OK-11.

Table 2-6. Summary of cultural analytic zones, Area 4, 45-OK-11.

Component	Zone	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m^3)	Density Objects (m^3)
Hudnut	1	VI	100	Aeolian deposit and surface litter mat	-	1,313	8	861 131	26 6	46 3,548	1	2,255	-	11.2	201.3
	2	V	125	Wind-midified alluvium	-	2,931	22	4,199 815	87 11	786 177,545	1	8,026	6	13.1	612.7
Karter	3	IV	151	Massive overbank and alluvial fan deposit	-	1,532	24	7,842 2,205	1,657 496	304 27,470	2	1,161	-	20.8	55.5
	4	IV	152	Massive overbank and alluvial fan deposit	4200±180	472	17	4,575 2,168	1,888 2,441	146 21,389	1	7,099	2	14.8	479.7
	5	IV	155	Massive overbank and alluvial fan deposit	4563±150	295	10	3,191 4,990	5,924 488	383 100,170	1	9,804	8	7.3	1,241.0
	6	III	160,200	Overbank deposits	5085±168	63	4	476	470	20	-	1,033	1	4.4	234.8

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

relatively dense, but no features were recorded. Stratum 125, DU V, contains a relatively dense cultural occupation (Zone 2) characterized by high proportions of lithics and FMR, and low proportions of shell in comparison with older zones. The youngest deposits, aeolian sediments of DU VI, contain a sparse cultural deposit with no features (Zone 1).

AREA 5/6

Area 5/6, the largest block excavation at the site (Figure 2-2) contains fifty-two 2 x 2-m units and one 1 x 2-m unit. A number of these units were partially or completely excavated in 1978 before the full-time stratigraphy crew arrived. During 1979, the crew profiled one off-site control unit west of the block plus 184 linear meters of walls within the block. Ten columns were sampled for sediment analysis. Figures 2-11 and 2-12 show the trench stratigraphy along two grid lines within the block area.

Two area designations were given to the Housepit 1 block to separate structures from general midden. Zones which occur above, below, or outside the housepits are preceded with an area designation of 5, while those corresponding to housepit constructional or depositional events are designated with a 6 (Table 2-7). The relationship between depositional units, zones, and cultural features is shown in Figure 2-13.

As previously noted, alluvial fan debris from Hopkins Canyon contributed to the sedimentary profile at the northern limit of the site. This debris built outward toward the river on the hardpan and channel bank deposits. Block Area 5/6 is located at the southern limit of this large fan. The excavation records from the units north of the block backfilled in 1978 reveal that Hopkins Canyon did deposit coarse, poorly sorted alluvium in that region. Finer grained, moderate to well sorted fan alluvium extends south into the main block.

The oldest cultural materials in this block (Zone 56) are pre-housepit occupational materials contained in the overbank deposits of DU III. Cultural materials are relatively sparse in this deposit, but the occurrence of some features indicates an in situ occupation. Later housepits cut into this deposit. The walls and floor of Lower Housepit 1 (Zone 65) are the next oldest separable cultural assemblage. Two radiocarbon dates were obtained from the floor and floor-wall: 4808±130 B.P. (TX-3379) and 5047±249 B.P. (B-4291). In Lower Housepit 1, this zone is overlain by a relatively sterile inter-floor deposit (Zone 62), and then the Upper Housepit 1 floor and associated walls (Zone 61). One radicarbon date was obtained from the Upper Housepit 1 floor, 4719±150 B.P. (TX-3380). Outside Upper and Lower Housepits 1, Zone 55 is contemporaneous with the Lower Housepit 1 floor and the inter-floor deposit, while Zone 54 is contemporaneous with the Upper Housepit 1 floor. The floor of Housepit 12 is designated as Zone 62. The fill of this housepit is apparently earlier than Upper Housepit 1, and has been designated as Zone 62. In Housepit 11, the floor, wall, and fill, which could not be separated because of how they were excavated, are together designated as Zone 64. A radiocarbon date of 4434±117 B.P. (B-4290) was obtained from the floor. Both Housepits 11 and 12 are overlain by deposits contemporaneous or earlier

Table 2-7. Summary of cultural analytic zones, Area 5/6, 45-OK-11.

Component	Zone	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m^3)	Density Objects (m^3)
Hudnut	51	VI	100	Aeolian with surface litter mat	-	1,830	13	4,164 938	406 1,016	101 17,969	3	6,617	-	60.2	109.9
	52	V	125	Wind-modified alluvium	-	3,512	38	12,636 2,215	3,652 13,409	867 180,489	3	20,702	8	60.5	342.2
	53	VI	151	Fill in Housepit 1 depression	-	4,593	90	32,292 7,149	9,852 44,729	1,069 149,692	5	47,901	12	43.6	1,098.6
Kartar	54	-	152,165	Contemporaneous with Housepit 1 upper floor	-	1,840	13	12,262 4,821	47,411 174,133	789 117,768	2	62,325	5	33.4	1,866.0
	55	-	155	Contemporaneous with Housepit 1 lower floor	-	407	9	4,064 2,091	3,734 12,085	104 23,579	1	8,319	4	29.7	280.1
	56	III	200	Overbank deposits	-	264	9	2,626 979	1,242 4,404	30 7,546	2	4,173	1	82.1	50.8
	61	IV	152	Housepit 1 upper floor and wall	4719±150	3,899	138	31,069 9,588	18,062 127,133	1,324 151,057	4	54,498	14	37.8	1,441.7
	62	-	153	Housepit 1 inter-floor deposit	-	641	13	5,835 2,369	3,353 15,330	105 25,465	2	9,949	3	16.4	606.6
	63	-	154	Housepit 12 wall and floor	4434±117	32	-	296 134	689 3,128	12 4,430	2	1,038	1	4.4	235.9
	64	-	158	Housepit 11 wall floor, and fill	-	264	1	2,461 710	898 7,621	66 27,202	-	3,810	6	6.4	595.3
	65	-	155	Housepit 1 lower floor	4804±130 5047±249	1,221	14	6,395 3,113	22,280 117,698	489 91,512	1	30,358	28	20.3	1,493.5

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

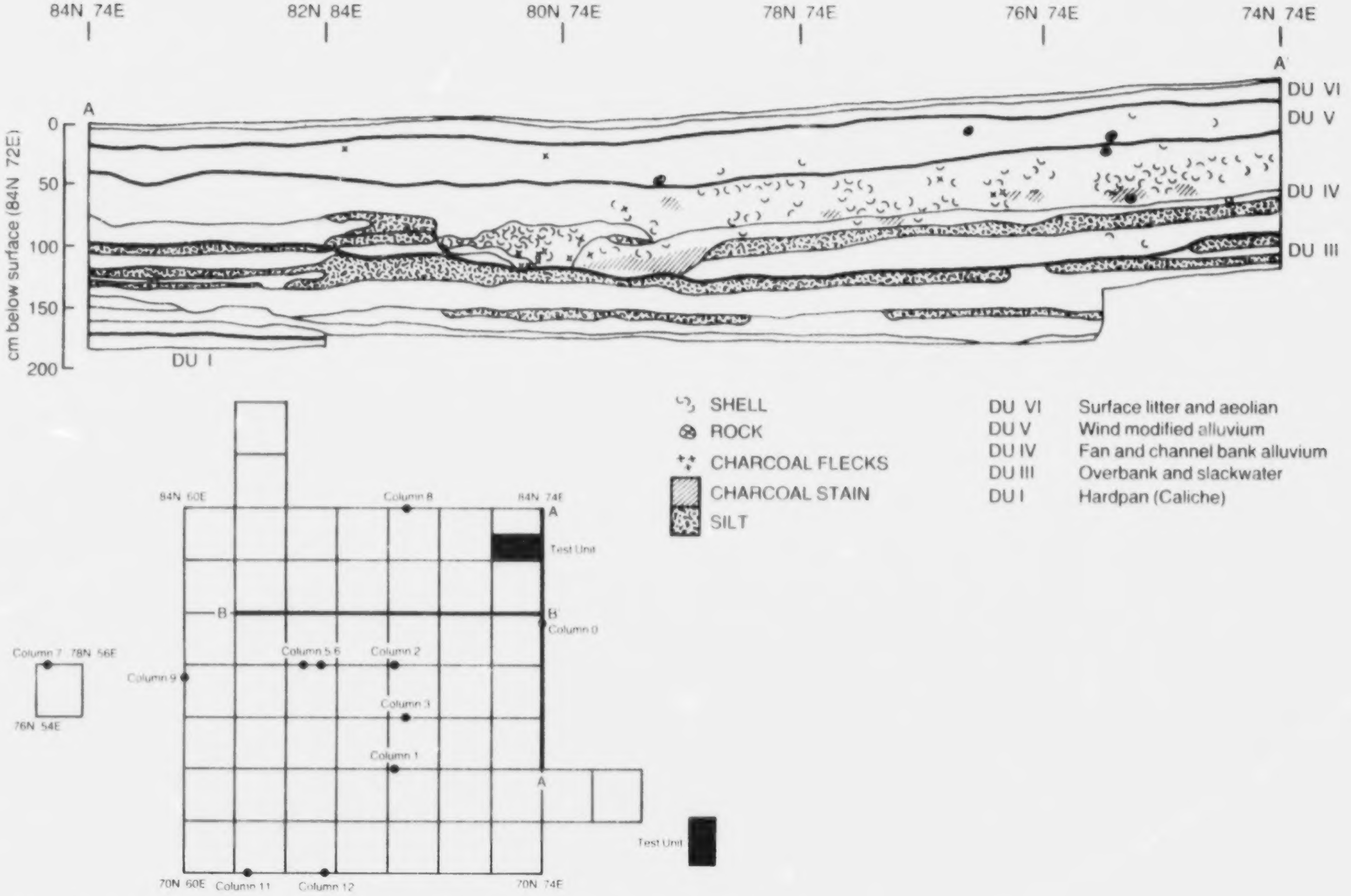
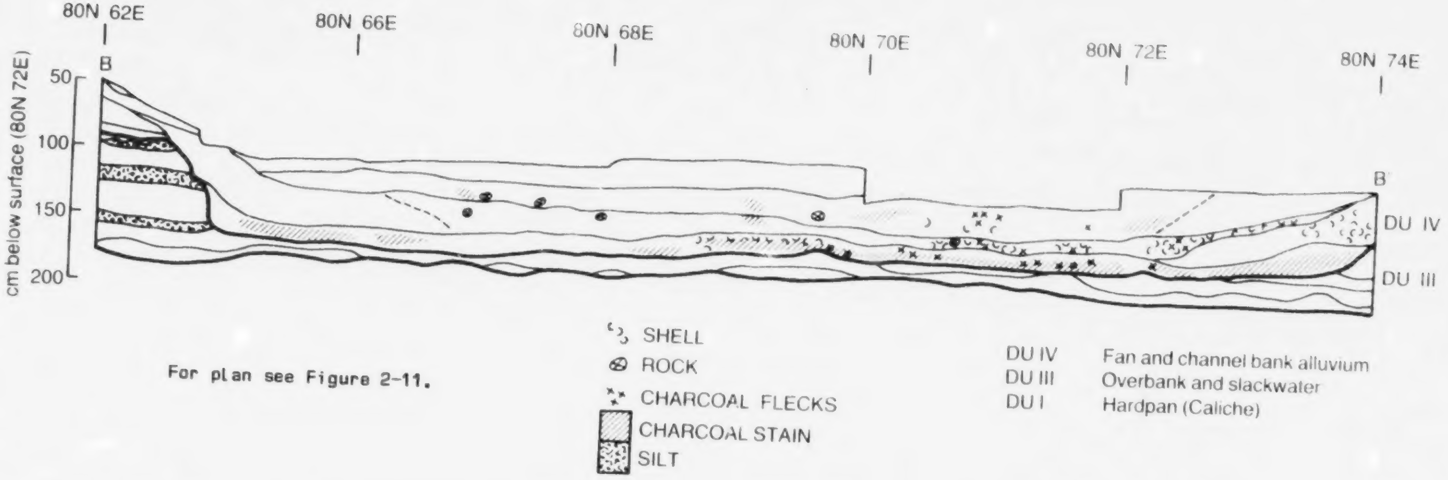

84N 74E
82N 84E
80N 74E
78N 74E
76N 74E
74N 74E
A
A'
0
50
100
150
200
cm below surface (84N 72E)
DU VI
DU V
DU IV
DU III
DU I
SHELL
ROCK
CHARCOAL FLECKS
CHARCOAL STAIN
SILT
DU VI Surface litter and aeolian
DU V Wind modified alluvium
DU IV Fan and channel bank alluvium
DU III Overbank and slackwater
DU I Hardpan (Caliche)
84N 60E
Column 8
84N 74E
Test Unit
B
Column 0
Column 7 78N 56E
76N 54E
Column 9
Column 5 6
Column 2
Column 3
Column 1
70N 60E
Column 11
Column 12
70N 74E
Test Unit

Figure 2-11. Stratigraphic profile of Area 5/6 at 74E, 45-OK-11.


80N 62E
80N 66E
80N 68E
80N 70E
80N 72E
80N 74E
B
B'
cm below surface (80N 72E)
50
100
150
200
DU IV
DU III
SHELL
ROCK
CHARCOAL FLECKS
CHARCOAL STAIN
SILT

DU IV	Fan and channel bank alluvium
DU III	Overbank and slackwater
DU I	Hardpan (Caliche)

For plan see Figure 2-11.

Figure 2-12. Stratigraphic profile of Area 5/6 at 80N, 45-OK-11.

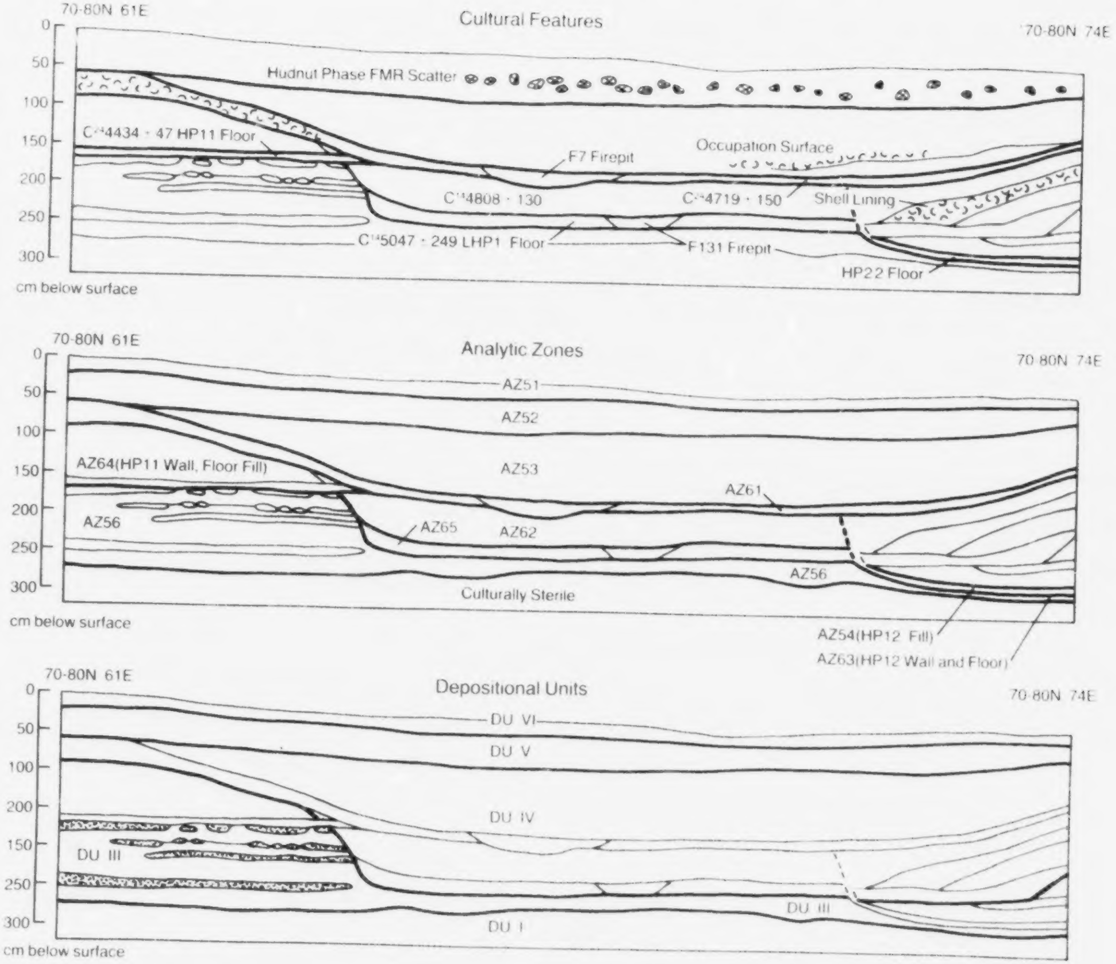

70-80N 61E
Cultural Features
70-80N 74E
Hudnut Phase FMR Scatter
C^{14}4434 · 47 HP11 Floor
F7 Firepit
Occupation Surface
C^{14}4808 · 130
C^{14}4719 · 150
Shell Lining
C^{14}5047 · 249 LHP1 Floor
F131 Firepit
HP22 Floor
cm below surface
0
50
100
150
200
250
300
Analytic Zones
AZ51
AZ52
AZ53
AZ64(HP11 Wall, Floor Fill)
AZ61
AZ56
AZ65
AZ62
AZ56
Culturally Sterile
AZ54(HP12 Fill)
AZ63(HP12 Wall and Floor)
Depositional Units
DU VI
DU V
DU IV
DU III
DU III
DU I

Figure 2-13. Schematic of deposits, cultural features, and zones in Area 5/6, 45-OK-11.

than the floor of Upper Housepit 1. This is at variance with the radiocarbon dates, as the radiocarbon date from the floor of Upper Housepit 1 is older than that from Housepit 11.

AREA 7/8

Area 7 is the block excavation north of the gully and Area 8 encompasses the isolated units north of the gully (Figure 2-2). Both areas have similar depositional histories; only the two major occupations were defined as zones in each area (Table 2-8). However, the block excavation was given a separate area designation to facilitate computer retrieval of separate data on this activity area. Although only limited stratigraphic data was available for these areas, it was possible to define the two components on the basis of the pattern established in other areas of the site. Zone 2 is associated with coarse sands overlying hardpan and cobbles, and contains relatively high proportions of bone and shell. Zone 1 in each area occurs in the upper 50-70 cm of the profile and has a higher proportion of FMR and lithics.

DISCUSSION

The large block excavations at 45-OK-11 provide narrow, distinct cuts of site stratigraphy across the site from north to south, revealing a complex sequence of multiple occupations. The sequence in each area varies, involving different types of cultural features and different numbers of discernable occupations, each of which is defined as a separate analytic zone. Neither stratigraphic information nor the radiocarbon dates (Figure 2-7) allow us to place all of these zones in chronological relationship to one another. Therefore, we have associated them into two site-wide cultural components that provide the best correlation for all analytic zones based on diverse lines of evidence: depositional association, radiocarbon dates, diagnostic artifact types, and discrete artifact distributions contained within defined cultural features.

The lower Kartar Phase component (ca. 5400-4200 B.P.) contains the greater number of cultural features (see Chapter 6) and exhibits a far more intricate picture of reoccupation episodes: housepits cut through earlier activity surfaces; spoil dirt from these and other constructions obliterates earlier features and their points of origin; numerous middens spill over into abandoned structures and across occupation surfaces; housepit fill deposits exhibit innumerable episodes of patterned living debris and jumbled trash. Eleven housepits were defined in the Kartar Phase component, of which only three (Upper and Lower Housepits 1 and Housepit 4) were sufficiently exposed that we could determine their outline and construction. Fifteen external activity surfaces were defined, and 24 middens were identified, comprising 19 shell, three bone, and two trash concentrations.

The 17 Kartar Phase dates (Figure 2-14) cluster tightly within a span of only ca. 1,200 years. If we accept that associated occupations probably occurred within the period marked by two standard deviations from the suggested date, we narrow the dated range to ca. 4600-5000 B.P. Stratigraphic

Table 2-8. Summary of cultural analytic zones, Areas 7 and 8, 45-OK-11.

Component	Zone	DU	Stratum	Major Description	Dendrocorrected Radiocarbon[1] Dates (years B.P.)	Lithics #	Nonlithics #	Bone # grams	Shell # grams	FMR # grams	Miscellaneous #	Total	Features[2] #	Volume (m^3)	Density Objects (m^3)
Hudnut	71	-	-	Silty sand	-	1,710	1	10,296 2,025	239 1,083	107 16,826	39	12,392	-	15.5	799.5
Karter	72	-	-	Medium to coarse sand with gravel	4486±134	2,381	22	34,062 17,201	2,672 14,410	274 32,856	49	39,460	3	24.5	1,610.6
Hudnut	81	-	-	Silty sand	-	650	3	973	30	46	23	1,725	-	16.9	107.1
Karter	82	-	-	Medium to coarse sand with gravel	4858±145	1,738	5	4,399 2,176	531 2,983	104 11,241	49	6,829	2	32.0	213.4

[1] For additional information on radiocarbon dates, see Table A-1.
[2] Number of field-recorded features.

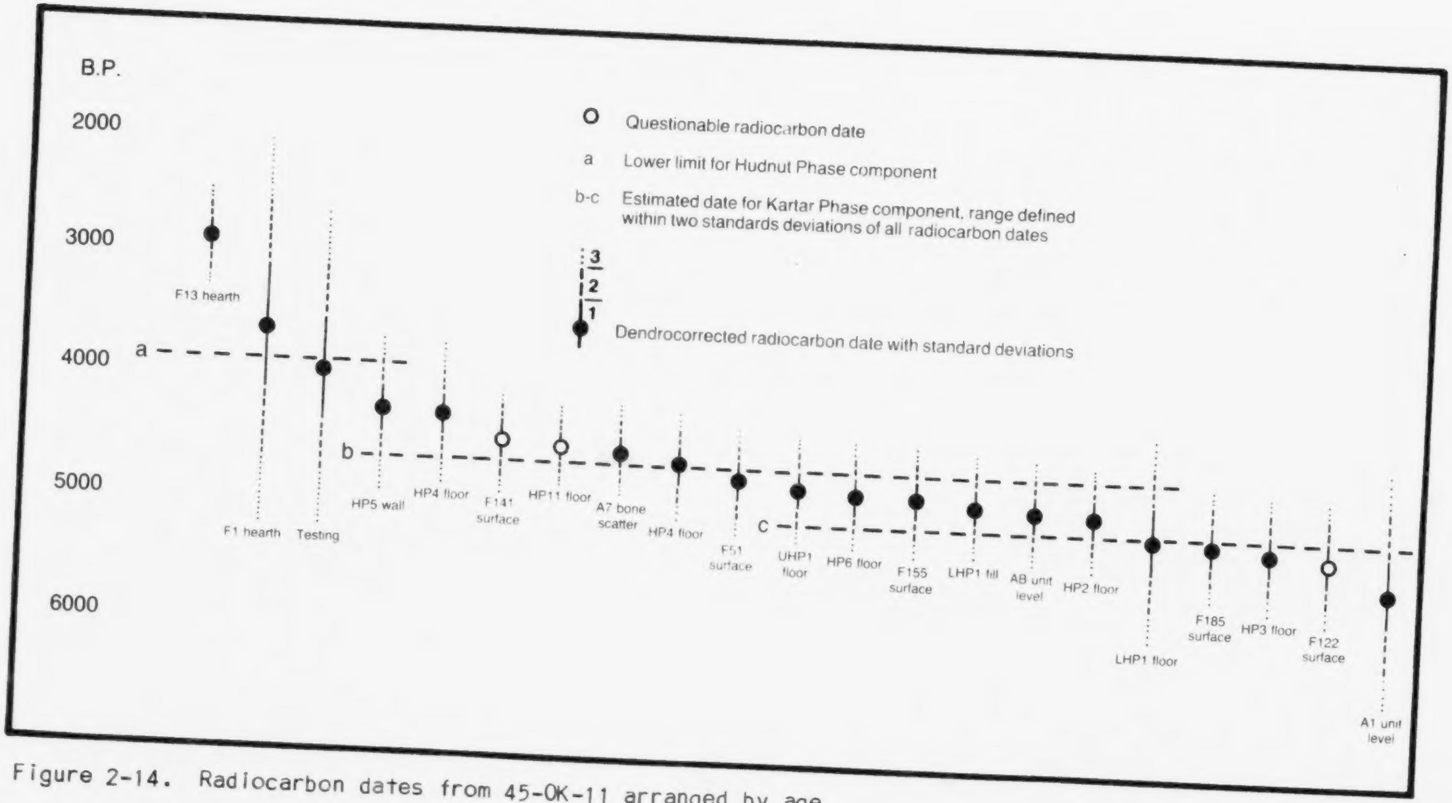


Figure 2-14. Radiocarbon dates from 45-OK-11 arranged by age.

correlations and associated radiocarbon dates indicate that even within this limited time span there are three possible sub-components, each containing housepits and associated external activity surfaces (Table 2-9). It is not at all implausible that there are there were three Kartar Phase housepit settlements at 45-OK-11, occupied over a period of less than 400 years. Stratigraphic context demonstrates that in at least one instance (Area 5/6 block), four housepits occurred in a radiocarbon dated span of less than 150-200 years. Further, in the fill between and above these housepits, activity surface and general debris indicate constant cultural activity at the site. Other excavation blocks preserve a similar picture of nearly continuous activity, although not so dramatically, nor in so well-dated a context. Thus, while we probably have at least three separate housepit settlements at the site, these occurred over a relatively brief period of time and are not necessarily separated by occupational hiatuses.

Table 2-9. Subcomponent assignments of radiocarbon-dated features, Kartar Phase components, 45-OK-11.

Period	Radiocarbon dates (B.P.)	Feature
Early	ca. 5400-5000	LHP1 Floor F185 Surface HP3 Floor F122 Surface
Middle	ca. 4900-4400	F141 Surface HP11 Floor Area 7 Bone Concentration HP4 Floor F51 Surface UHP1 Floor HP6 Floor F155 Surface LHP1 Fill HP2 Floor
Late	ca. 4200	HP5 Wall HP4 Floor

The upper Hudnut Phase component (ca. 3900-2800 B.P.) yielded far fewer cultural features, primarily sprawling scatters of lithics, shell, bone, fire-modified rock, and isolated firepits. The relative lack of cultural features and small number of radiocarbon dates precludes any finer temporal division of the Hudnut component. We infer that site occupations were brief and entailed small activity-specific tasks. Site use was remarkably consistent, if sporadic.

Analysis and description throughout the remainder of the report focuses on the two sitewide components, the Kartar Phase (ca. 5400-4200 B.P.), and Hudnut Phase (ca. 3900-2800 B.P.), and the contrasts between them. Intensive site use involving multiple episodes of dwelling construction and large external activity foci where groups of related households performed tasks throughout most, if not all, of the year is documented for the early period at the site. A pronounced shift in site use is evident in the later period, manifest in less stratigraphic complexity and far fewer cultural features, comprising diffuse artifact scatters and isolated firepits.

3. ARTIFACT ANALYSIS

Artifacts recovered from site 45-OK-11 have been subjected to three separate analyses. **Technological** analysis describes elements of prehistoric tool manufacture, detailing processes of lithic reduction. **Functional** analysis describes attributes of wear on tools and develops inferences concerning the use of tools at the site. **Stylistic** analysis describes morphological elements that have demonstrated temporal and spatial significance and compares recovered artifacts with types defined outside the project area. Analyses were focused on lithic artifacts with the assumption that these artifact classes would be of the most value in comparisons with other researchers' work and in developing reconstructions of site activities. Artifacts of bone, shell, and other non-lithic materials, although included in the classifications wherever appropriate, are only described in detail selectively.

All artifact analyses take the form of paradigmatic classifications as defined by Dunnell (1971, 1979). In this system, commonly used descriptive terms take on specific meanings. Depending on the purposes of the classificaton attributes are selected which describe morphological variation relevant to stages of tool manufacture, specific uses of tools, or when the tool was made and used. Attributes are combined into sets: those that describe morphological variation in the artifact assemblage without reference to cultural origin are called features, while those that represent cultural activity are called modes. During anaysis each artifact is identified by the single feature or mode that characterizes it. By organizing the features and modes into larger organizations termed dimensions, and by cross-tabulating these, sets of comparable but mutually exclusive classes can be formed. From study of these classes, inferences may be drawn concerning the nature of tool manufacture, use, and distribution in time and space.

Our classificatory dimensions and constituent attributes are not truly exhaustive and must be viewed as broad analytic categories designed to signal obvious morphological variation. Whenever possible, our defined attributes approximate characteristics identified in earlier research as important technological, functional, or stylistic indicators. Further, it will be apparent that analytic levels within the paradigmatic classifications often preclude direct comparison with more traditional typological approaches. For example, in several instances these analyses will focus on the tool, and not on the artifacts, because an artifact may have more than one tool or use. These classes are then only related to more standard classifications by cross-correlation with more traditional artifact designations (e.g., biface, drill, or chopper). Discussion, therefore, involves analysis both at the level of the tool and of the artifact. The reader should keep in mind that this distinction will be kept throughout.

In the following subsections we present the descriptive data from technological, functional, and stylistic analysis. The data is organized in terms of the two major cultural components outlined in the preceding section. The earlier spans a period from ca. 5400-4200 B.P. The later component dates from ca. 3900-2800 B.P. Defined on the basis of stratigraphic distribution of radiocarbon dates, cultural features, and projectile point types, these components represent the Kartar and Hudnut Phases defined for the Rufus Woods Lake project area. We also examine selected artifact classes in terms of their location in relation to cultural features of interest within the Kartar phase. For example, artifacts from housepit floors are compared to those found on external living surfaces; both of these, in turn, are compared to collections from matrix outside these cultural features.

TECHNOLOGICAL ANALYSIS

Prior researchers have described general manufacturing sequences in the production of stone tools, and thereby have identified specific morphological elements associated with certain methods of production and particular steps in the reductive sequence (e.g., Crabtree 1972, 1976a,b; Flenniken and Garrison 1975; Muto 1971, 1976; Smith and Goodyear 1976; Speth 1972; Stafford 1977; Swanson 1975).

While the process of lithic reduction may vary greatly even within defined industries, an idealized trajectory of reduction, with certain fundamental steps, can be constructed. First, the knapper selects a nodule which will serve as a core for the production of flakes of suitable size and shape. The first flakes removed exhibit the weathered surface of the stone. Later flakes show little or no weathered surface, and may have flake scars from the initial flaking. All of these flakes may be removed with a hard hammer of stone, creating distinctive large flakes with pronounced bulbs of percussion, strong stress lines, and crushed striking platforms. Once flakes are of a suitable size, the knapper modifies them further with a soft hammer of antler or wood, producing smaller flakes with less pronounced bulbs of percussion, finer stress lines, and little or no crushing of the striking platforms. Later, after the artifact has been roughed out to the desired shape, the knapper may remove still smaller flakes with an antler tine to sharpen, finely shape, and maintain working edges on the tool.

This is, of course, an extreme simplification. Not only are there innumerable variations in the sequence of steps and tools used, there are also several related processes with distinctive steps and products. The above description characterizes a flake tool technology, wherein hammers of different materials are used to detach thin, lammellar flakes by direct percussion. There is a related blade industry, where hammers or punches are used to create long, narrow flakes with prismatic cross sections. This technique requires a more prepared core, and may involve indirect as well as direct percussion (cf., Leonhardy and Muto 1972; Muto 1976). In turn, these industries may be contrasted with a microblade industry in which small, fine fabricators to detach flakes from carefully prepared wedge-shaped cores. Very small, thin blades with one or more arrises are produced, which are in themselves finished tool forms requiring no further modification (cf., Sanger 1968, 1970b). While clearly distinct, these three industries need not have been independent, as one could easily complement the others as part of a more comprehensive industry. That this is in fact the case is suggested by the presence of flake and blade industries in early assemblages on the Columbia Plateau (Leonhardy and Rice 1970; Leonhardy et al. 1971).

Artifact types are the best indicators of lithic industries (e.g., cores, blades and flakes, and tools made from blades or flakes). Core configuration is distinctive; flakes, blades, and microblades are also readily distinguished. Tools often evidence attributes of origin like arris remnants or striking platforms. Other characteristics, although quite recognizable, are less certain diagnostic indicators, and often blend into the general signposts of lithic reduction outlined above (e.g., detritus, flake size, presence or absence of cortex, etc.).

In technological analysis, we record attributes indicative of these steps in stone tool manufacture, and characteristic of these three reduction techniques.

Technological analysis makes use of seven dimensions: OBJECT TYPE, MATERIAL, CONDITION, DORSAL TOPOGRAPHY, TREATMENT, KIND OF MANUFACTURE, and MANUFACTURE DISPOSITION. These describe the kind and condition of artifacts and the materials from which they are made. Descriptive attributes of WEIGHT, LENGTH, WIDTH, and THICKNESS are also measured, and supplement the classificatory dimensions. Table 3-1 lists these dimensions and attributes.

To discuss the technological analysis at 45-OK-11 we must first review the analysis of the artifacts in the laboratory, a process that went on from September 1978 to August 1982. Over that time, analysis proceeded intermittently, involving 21 different analysts and eight separate analytic frameworks, representing practical adjustments made to accommodate increasingly tight schedules or to compensate for oversights in the construction of the analysis itself. These changing analyses resulted in instances of noncomparable data categories. While one dimension (dorsal topography) did remain consistent, the others (object type, material type, treatment, condition, length, width, and thickness measurements) were modified throughout the phases of analysis.

Over the course of analysis, material types were added frequently, gradually increasing from 13 to 41 possible types. These will be collapsed into larger material groups to ensure comparability. One division is simply cryptocrystalline versus non-cryptocrystalline stones. The other consists of eight material groups: CCS (cryptocrystalline siliceous material), quartzite, fine-grained quartzite, basalt, obsidian, granite, other, and indeterminate (Table 3-1).

Table 3-1. Technological dimensions.

DIMENSION I: OBJECT TYPE

- Conchoidal flake
- Chunk
- Core
- Linear flake
- Unmodified
- Tabular flake
- Formed object
- Weathered
- Indeterminate

DIMENSION II: RAW MATERIAL*

- Jasper
- Chalcedony
- Petrified Wood
- Opal
- **Quartzite**
- **Fine-grained quartzite**
- **Basalt**
  - Basalt
  - Fine-grained basalt
- **Granitic**
- **Obsidian**
- **Other**
  - Silicized mudstone
- Argillite
  - Sandstone
  - Nephrite
  - Siltstone/mudstone
  - Steatite
  - Schist
  - Shale
- **Indeterminate**
- **Nonlithic**
  - Bone/antler
  - Shell

DIMENSION III: CONDITION

- Complete
- Proximal fragment
- Proximal flake
- Less than 1/4 inch
- Broken
- Indeterminate

DIMENSION IV: DORSAL TOPOGRAPHY

- None
- Partial cortex
- Complete cortex
- Indeterminate/not applicable

DIMENSION V: TREATMENT

- Definitely burned
- Dehydrated (heat treatment)

ATTRIBUTE I: WEIGHT

Recorded weight in grams

ATTRIBUTE II: LENGTH

Flakes: length is measured between the point of impact and the distal end along the bulbar axis

Other: length is taken as the longest dimension

ATTRIBUTE III: WIDTH

Flakes: width is measured at the widest point perpendicular to the bulbar axis

Other: width is taken as the maximum measurement along an axis perpendicular to the axis of length

ATTRIBUTE IV: THICKNESS

Flakes: thickness is taken at the thickest point on the object, excluding the bulb of percussion and the striking platform

Other: thickness is taken as the measurement perpendicular to the width measurement along an axis perpendicular to the axis of length

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* Only those raw materials recorded from the site are listed here; a complete list is available in the Project's Research Design (Campbell 1984d). In some tables the materials are grouped into the categories indicated in bold type; constituent materials are indented.

We describe but do not emphasize the object types assigned during technological analysis because these types were not necessarily used consistently throughout the analysis. Rather, we rely on the more consistently applied functional types. However, debitage categories are carried over from the technological analysis as these materials were not re-analyzed in the functional analysis.

Since the dimension dorsal topography remained consistent through the analyses we will use it throughout this discussion. Dimensions of treatment and condition will only be presented in abbreviated form, with those attributes that were carried through the entire analysis. All measurements are valid, but represent only a small fraction of the material available, since at certain points in the analysis objects were not measured if broken, and, at others, objects were measured if at all possible, whether broken or not. While these inconsistencies do not make the data unreliable, they must be kept in mind throughout the following discussion.

Since technological processes vary according to the raw material used, we will first describe the distribution of material types at the site. We may then consider object types and functional types, their condition, treatment, and the kind and extent of manufacture. We will use dorsal topography combined with material type and object type to reconstruct patterns of stone tool manufacture. To make inferences about stages of reduction we will use amount of cortex and size of flakes. Functional types demonstrate end products of those sequences and document variation in the idealized trajectory of forms.

MATERIAL TYPES

Artifacts at 45-OK-11 were made from a range of cryptocrystalline and non-cryptocrystalline stones, with cryptocrystalline stones (jasper, opal, petrified wood, chalcedony) occurring in the greatest quantities (Table 3-2). Quartzite and basalt are the most frequent non-cryptocrystalline stones.

Jasper is common in both components. Other materials with relatively even distributions include chalcedony, quartzite, granite, and miscellaneous non-cryptocrystalline types. Exceptions are opal and basalt, which show markedly higher frequencies in the Kartar component. Cryptocrystalline stones comprise 48% of the material types in the Kartar component, but rise to 68% in the Hudnut component. There is a corresponding decrease in basalt (26% to 15%) and quartzite (24% to 16%) in the Hudnut component.

Cryptocrystalline and non-cryptocrystalline stones, of course, have very different average weights, reflecting both the different structural properties of the stones and how man used them, as well as possible difference in tool manufacture between the two components. For instance, the artifacts fashioned from basalt are consistently larger and heavier than those made from jasper, chalcedony, or opal. Basalt artifacts decrease in size from from the Kartar component to the Hudnut component. Conversely, the artifacts fashioned from quartzite, which, like those of basalt, are larger and heavier, increase in size from from the Kartar component to the Hudnut component. Both stones are

Table 3-2. Counts of lithic material by analytic zone, 45-OK-11.

Material	Hudnut Component			Karter Component			Total[1]
	N	Col%	$\bar{x}$ (gm)	N	Col%	$\bar{x}$ (gm)	N
Jasper	9,988	40.3	5.0	9,565	35.4	7.3	19,553
Chalcedony	1,588	6.4	6.2	1,669	6.2	6.7	3,257
Petrified wood	31	0.1	29.5	44	0.2	20.4	75
Obsidian	70	0.3	1.2	57	0.2	5.4	127
Opal	5,188	20.9	14.7	1,705	6.3	25.1	6,893
Quartzite	3,402	13.7	191.5	5,298	19.6	114.0	8,700
Fine-grained quartzite	523	2.1	1,895.8	1,174	4.3	426.3	1,697
Basalt	2,632	10.6	233.7	5,115	18.9	1,110.3	7,747
Fine-grained basalt	991	4.0	42.5	1,815	6.7	180.0	2,806
Silicized mudstone	103	0.4	5.7	111	0.4	9.5	214
Argillite	39	0.2	5.1	54	0.2	140.4	93
Granitic material	112	0.5	5,448.7	204	0.8	29,169.2	316
Sandstone	1	<0.1	2.0	1	<0.1	13.0	2
Nephrite	9	<0.1	-	16	0.1	2,094.7	25
Siltstone/ Mudstone	5	<0.1	458.8	10	<0.1	121.0	15
Steatite	1	<0.1	1.0	2	<0.1	8.0	3
Schist	15	0.1	2.9	13	<0.1	197.6	28
Shale	7	<0.1	47.9	10	<0.1	6.2	17
Indeterminate	98	<0.4	306.9	164	0.6	1,531.5	262
Total	24,803			27,027			51,830

[1] Does not include 132 objects not assigned to zones.

coarse-grained, some varieties do not fracture conchoidally, and could be predicted to occur always in larger pieces than the fine-grained, conchoidally-fracturing cryptocrystalline stones. Yet, they exhibit two very different patterns, which most likely indicates very different tool manufacturing activities. The decrease in basalt and quartzite artifacts from the Kartar component to the Hudnut component represent a difference in technical expertise and the nature of the reduction sequence, or it could reflect separate cultural systems with distinct tool forms and projected uses, or both.

ARTIFACT TYPES

Artifacts have been divided into four major classes; debitage, flake tools, formed tools, and unformed tools. Debitage includes all residual elements of the reduction process: cores, conchoidal flakes, tabular flakes, <1/4 in flakes, and chunks. Flake tools are artifacts in which the original shape of the flake has been only slightly modified, or not at all: utilized flakes, linear flakes, blades, unifacially retouched flakes, bifacially retouched flakes, and resharpened flakes. Formed tools are artifacts in which the original form has been greatly modified (e.g., projectile points, bifaces, scrapers, drills). Unformed tools are those in which the original shape of the stone was only slightly modified, if at all (e.g., hammerstones, millingstones, anvils, hopper mortar bases).

Table 3-3 lists artifact types by material group, dorsal topography, and cultural component. Cryptocrystalline and basalt contain the greatest variety of artifact types, as well as the highest frequencies in all categories except tabular flakes, tabular knives, and unformed objects. Further, the Kartar component has a much greater variety of tool types and material types than the Hudnut component. It contains a much higher frequency of debitage with cortex (Kartar component=22%, Hudnut component=11%), has more flake tools with cortex (Kartar component=8%, Hudnut component=4%), and much higher proportions of formed tools with cortex (Kartar component=49%, Hudnut component=20%). The Hudnut component only exceeds the Kartar component in its percentage of CCS gravers, CCS projectile points, quartzite tabular knives, and CCS conchoidal flakes without cortex. Percentages of unformed tools with or without cortex are about the same in both assemblages.

The Kartar component exhibits a greater emphasis on the use of noncryptocrystalline stones: it has higher relative proportions of debitage with cortex, flake tools with cortex, and formed tools with cortex, as well as a greater variety of tool types of quartzite, basalt, and granite. In both components, a basic, generalized flake tool industry that produced similar kinds of waste products and tools was prevalent. However, reduction in the Kartar component also entailed Levallois-like blade production and manufacture of a range of cobble tools from the locally available coarse-grained quartzite, basalt, and granite. The presence of these cobble tools has swelled the proportion of debitage, and flaked and formed tools in the Kartar component.

Table 3-3. Object type and dorsal topography by material and component, 45-OK-11.

Material	Industry	Dorsal Topography	Hudnut Component	Kartar Component	Total
CCS					
	Debitage				
	Core	None	–	3	3
		Indeterminate	–	–	–
	Conchoidal flake	None	14,078	9,828	23,906
		Partial	80	82	162
		Complete	4	4	8
		Indeterminate	19	31	50
	Tabular flake	None	2	2	4
	<1/4-Inch flake	Indeterminate	969	1,947	2,916
	Chunk	None	1,030	504	1,534
		Partial	32	24	56
		Complete	2	–	2
		Indeterminate	11	23	34
	Flake Tools				
	Utilized flake	None	181	160	341
		Partial	5	4	9
	Linear flake	None	2	2	4
	Blade	None	1	4	5
	Unifacially retouched flake	None	73	66	139
		Partial	1	4	5
		Indeterminate	–	1	1
	Bifacially retouched flake	None	46	31	77
		Partial	3	3	6
		Indeterminate	1	–	1
	Resharpening flake	None	9	13	22
	Formed Tools				
	Scraper	None	12	22	34
		Partial	–	1	1
	Chopper	None	–	1	1
	Biface	None	89	93	182
		Partial	–	2	2
		Indeterminate	1	1	2
	Burin	None	2	2	4
	Burin spall	None	2	1	3
	Graver	None	14	7	21
		Partial	1	–	1
	Drill	None	3	4	7
		Partial	1	–	1
		Indeterminate	–	1	1
	Projectile point	None	110	91	201
		Partial	–	2	2
		Indeterminate	3	1	4
	Indeterminate	None	2	1	3
		Partial	–	1	1
Quartzite	Debitage				
	Core	Partial	2	–	2
	Conchoidal flake	None	200	253	453
		Partial	164	300	464
		Complete	3	7	10
		Indeterminate	1	1	2
	Tabular flake	None	2,100	3,032	5,134
		Partial	635	1,327	1,962
		Complete	32	39	71
		Indeterminate	12	15	27
	<1/4-Inch flake	Indeterminate	71	38	109
	Chunk	None	27	41	68
		Partial	80	89	169

Table 3-3. Cont'd.

Material	Industry	Dorsal Topography	Hudnut Component	Kartar Component	Total
	Flake Tools				
	Utilized flake	None	–	1	1
	Unifacially retouched flake	None	–	2	2
		Partial	1	–	1
	Bifacially retouched flake	Partial	–	1	1
		Indeterminate	–	1	1
	Formed Tools				
	Chopper	None	–	2	2
		Partial	–	24	24
	Tabular knife	None	24	32	56
		Partial	39	78	117
		Complete	2	1	3
		Indeterminate	–	1	1
	Projectile point	None	1	2	3
	Indeterminate	None	–	1	1
	Unformed Tools				
	Hammerstone	Partial	1	1	2
		Complete	–	2	2
	Millingstone	Partial	1	1	2
Fine-grained Quartzite	Debitage				
	Core	Partial	–	–	–
		Interminate	–	–	–
	Conchoidal flake	None	267	633	900
		Partial	147	375	522
		Complete	2	6	9
		Indeterminate	1	2	3
	Tabular flakes	None	59	31	90
		Partial	5	19	24
		Complete	–	1	1
	<1/4-Inch flake	Indeterminate	4	6	10
	Chunk	None	13	25	38
		Partial	11	27	38
		Indeterminate	–	1	1
	Flake Tools				
	Utilized flake	None	2	3	5
	Unifacially retouched flake	Partial	–	1	1
		Indeterminate	–	1	1
	Bifacially retouched flake	None	–	2	2
		Partial	–	–	1
		Indeterminate	–	1	1
	Formed Tools				
	Scraper	None	–	1	1
	Chopper	Partial	2	17	19
		Complete	–	1	1
		Indeterminate	–	4	4
	Biface	None	1	2	3
	Tabular knife	None	2	1	3
		Partial	2	1	3
	Projectile point	None	–	3	3
	Amorphously flaked cobble	Partial	–	2	2
		Indeterminate	–	1	1
	Pestle	Indeterminate	–	1	1
	Unformed				
	Hammerstone	Partial	–	3	3
		Complete	3	1	4
	Millingstone	Complete	1	–	1

Table 3-3. Cont'd.

Material	Industry	Dorsal Topography	Hudnut Component	Kartar Component	Total
Basalt	Debitage				
	Core	Partial	–	–	–
	Conchoidal flake	None	2,120	3,642	5,762
		Partial	1,262	2,662	3,924
		Complete	16	36	52
		Indeterminate	13	23	36
	Tabular flake	None	4	3	7
		Partial	5	3	8
		Indeterminate	–	1	1
	<1/4-Inch flake	Indeterminate	14	54	68
	Chunk	None	44	101	145
		Partial	54	120	174
		Complete	1	–	1
		Indeterminate	4	1	5
	Flake Tools				
	Utilized flake	None	6	10	16
		Partial	1	2	3
		Indeterminate	1	–	1
	Linear flake	None	–	1	1
	Unifacially retouched flake	None	1	4	5
		Partial	–	9	9
	Bifacially retouched flake	None	–	5	5
		Partial	1	3	4
		Complete	1	–	1
	Resharpening flake	None	–	2	2
	Formed Tools				
	Chopper	None	–	1	1
		Partial	14	143	157
		Complete	–	3	3
		Indeterminate	–	1	1
	Biface	None	11	6	17
		Partial	1	2	3
	Tabular knife	None	–	1	1
		Partial	1	1	2
	Graver	None	–	1	1
	Projectile point	None	10	18	28
		Partial	1	2	2
		Indeterminate	2	2	4
	Amorphously flaked cobble	Partial	–	9	9
		Complete	1	3	4
	Peripherally flaked cobble	Partial	–	2	2
	Netsinker	Partial	–	2	2
	Pestle	Partial	–	2	2
	Maul	None	–	2	2
	Bead	None	2	–	2
	Indeterminate	None	1	2	3
		Partial	6	9	15
		Complete	1	2	3
		Indeterminate	1	2	3
	Unformed Tools				
	Hammerstone	Partial	11	12	23
		Complete	7	10	17
	Edge-Ground cobble	Partial	–	2	2
		Indeterminate	1	–	1
	Anvil	Partial	–	1	1
		Complete	–	1	1
	Hopper mortar base	Complete	–	1	1
	Millingstone	Complete	–	1	1

Table 3-3. Cont'd.

Material	Industry	Dorsal Topography	Hudnut Component	Kartar Component	Total
Granitic	Debitage				
	Core	None	-	-	-
		Partial	-	-	-
	Flake	None	34	46	80
		Partial	40	71	111
		Complete	1	3	4
		Indeterminate	2	-	2
	Tabular flake	None	2	1	3
		Partial	-	1	1
	<1/4-Inch flake	Indeterminate	1	-	1
	Chunk	None	6	7	13
		Partial	5	18	23
		Indeterminate	-	1	1
	Flake Tools				
	Bifacially retouched flake	Partial	1	-	1
	Formed Tools				
	Chopper	Partial	2	2	4
		Complete	-	1	1
	Amorphously flaked cobble	Partial	-	1	1
	Peripherally flaked cobble	Partial	-	3	3
	Netsinker	Partial	1	-	1
	Pestle	None	1	-	1
		Partial	1	-	1
	Maul	None	1	-	1
	Indeterminate	Partial	3	2	5
		Complete	-	1	1
		Indeterminate	-	2	2
	Unformed Tools				
	Hammerstone	None	-	1	1
		Partial	2	4	6
		Complete	7	12	19
	Edge-ground cobble	Partial	-	1	1
	Anvil	Complete	-	2	2
	Hopper mortar base	Partial	-	1	1
		Complete	-	1	1
	Millingstone	Partial	1	7	8
		Complete	1	13	14
		Indeterminate	-	2	2
Obsidian	Debitage				
	Conchoidal flake	None	63	47	110
		Partial	-	3	3
	Tabular flake	None	1	-	1
	<1/4-Inch flake	Indeterminate	4	3	7
	Chunk	None	1	-	1
		Indeterminate	-	3	3
	Formed Tool				
	Biface	None	1	-	1
	Projectile point	None	-	1	1

Table 3-3. Cont'd.

Material	Industry	Corsal Topography	Hudnut Component	Kartar Component	Total
Other	Debitage				
	Core	Partial	–	1	1
	Flake	None	132	151	283
		Partial	6	11	17
		Complete	1	–	1
		Indeterminate	3	2	5
	Tabular flake	None	6	6	12
		Partial	1	1	2
		Indeterminate	1	1	2
	<1/4-Inch flake	Indeterminate	1	1	2
	Chunk	None	12	12	24
		Partial	2	4	6
		Indeterminate	7	9	16
	Flake Tools				
	Utilized flake	None	–	1	1
	Formed Tools				
	Chopper	Partial	–	2	2
	Biface	None	–	1	1
	Projectile point	None	1	–	1
	Shaft abrader	Indeterminate	2	1	3
	Bead	None	–	1	1
		Indeterminate	1	–	1
	Shaped/incised stone	Partial	1	–	1
		Indeterminate	2	8	10
	Indeterminate	None	–	1	1
		Indeterminate	–	1	1
Indeterminate	Debitage				
	Core	Partial	–	–	-
	Flake	None	43	86	129
		Partial	6	12	18
		Complete	–	1	1
	Tabular flake	None	5	8	13
		Indeterminate	1	–	1
	<1/4-Inch flake	Indeterminate	1	7	8
	Chunk	None	18	10	28
		Partial	2	2	4
		Indeterminate	3	2	5
	Flake Tools				
	Utilized flake	None	1	–	1
	Bifacially retouched flake	Partial	–	1	1
	Formed Tools				
	Chopper	Partial	–	2	2
	Pestle	Partial	–	1	1
	Bead	None	–	1	1
		Indeterminate	2	1	3
	Shaped/incised stone	Indeterminate	–	2	2
	Indeterminate	Complete	–	1	1
		Indeterminate	–	4	4
	Unformed Tools				
	Hammerstone	Partial	1	–	1
		Complete	2	1	3
	Hopper mortar base	Partial	–	1	1
	Millingstone	Partial	–	1	1
Total			23,709	24,934	48,643

Figure 3-1 records artifact distribution by eight major material groups (obsidian is excluded because of its negligible count) and by the four major tool classes. Debitage is predominantly CCS in both components, although the Kartar component exhibits a smaller percentage of CCS and a greater percentage of basalt, quartzite, and fine-grained quartzite. While an even greater percentage of the flake tools of both components are CCS, the Kartar component again exhibits higher percentages of basalt, quartzite, and fine-grained quartzite than the later component. With regard to formed tools, basalt and cryptocrystalline materials make up similar percentages, and quartzite contributes a high percentage as well. While the Hudnut component exhibits substantial percentages of both quartzite and basalt, most of its formed tools are of CCS. Percentages of unformed tools are similiar in both components, with the exception of a high percentage of granitic tools in the Kartar component.

Figure 3-2 summarizes the distribution of debitage by the eight material groups. What is most striking is the very similar pattern exhibited by both the Kartar and Hudnut components. This indicates a remarkable similarity in patterns of reduction at the site, despite the different goals for those reduction sequences, as manifested by the differing proportion of the component's artifact and material types.

Figure 3-3 charts distributions of fine-grained, cryptocrystalline and non-cryptocrystalline stone by dorsal topography and component. Jasper, chalcedony, petrified wood, opal, and obsidian--all of which are exotic stones which must have been transported to the site--are consistently secondary flakes (no cortex). This implies that these materials were transported in partially reduced forms such as blanks, preforms, or flakes. Quartzite, fine-grained quartzite, and basalt have a much higher percentage of primary flakes (with cortex), always exceeding 25% of the total recovered. In the Kartar component, the percentage of basalt primary flakes exceeds that of the secondary flakes, a reversal of the usual pattern. In this component, fine-grained basalt and argillite also have higher proportions of primary flakes, although they are much smaller than those observed for quartzite, fine-grained quartzite, and basalt. That argillite does not match these in percentage may well be due to its scarcity--it is not common in the Columbia River gravels. Fine-grained basalt is available nearby, however. While this may explain the relatively high proportions of this material in both components, it does not explain why it does not match the very high percentages of quartzite, fine-grained quartzite, and basalt.

In both cultural components, only locally available, noncryptocrystalline stones (quartzite, fine-grained quartzite, basalt, fine-grained basalt) were routinely reduced from cores or initial products of the production trajectory. Cryptocrystalline material types (jasper, chalcedony, opal), although the most numerous in both components, usually were transported to the site in some partially finished form. Flake tools commonly were made of CCS types in both components. Formed tools and unformed tools show the most variability, with basalt, and granite supplying a higher percentage of these tool types in the Kartar component.

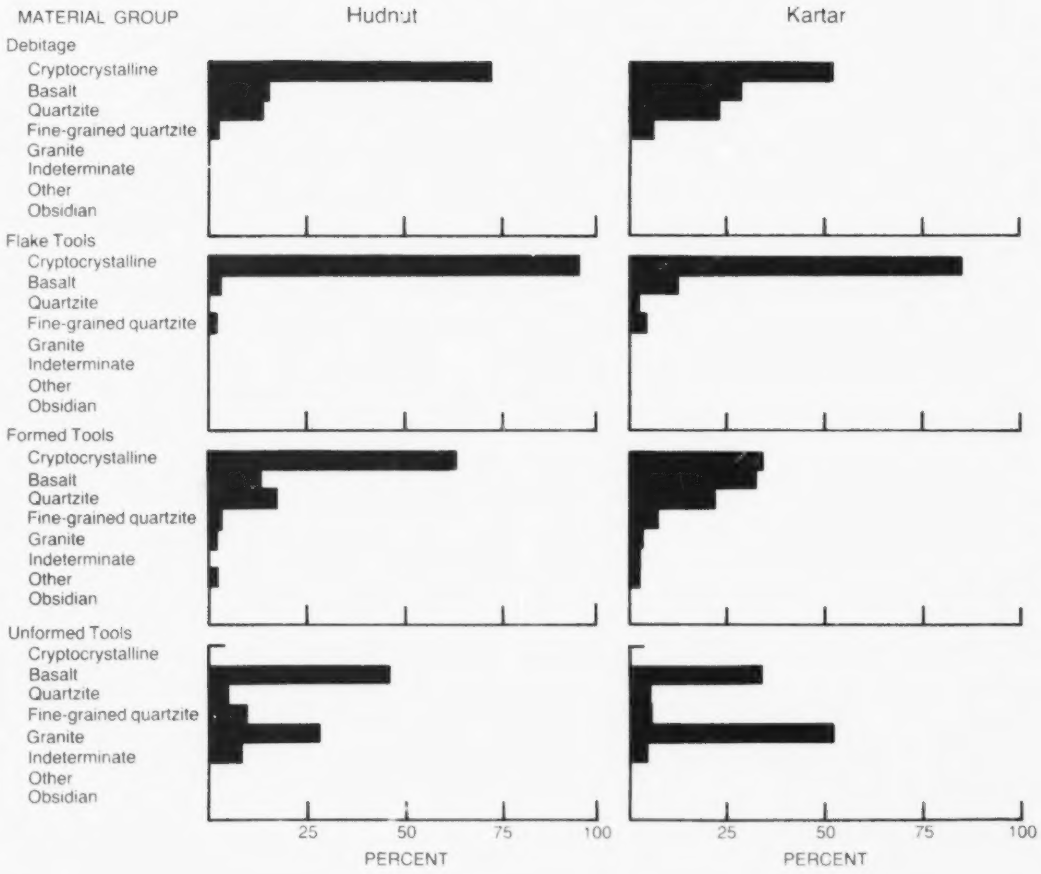

Figure 3-1. Distribution of eight material groups within the four major tool classes, 45-OK-11.

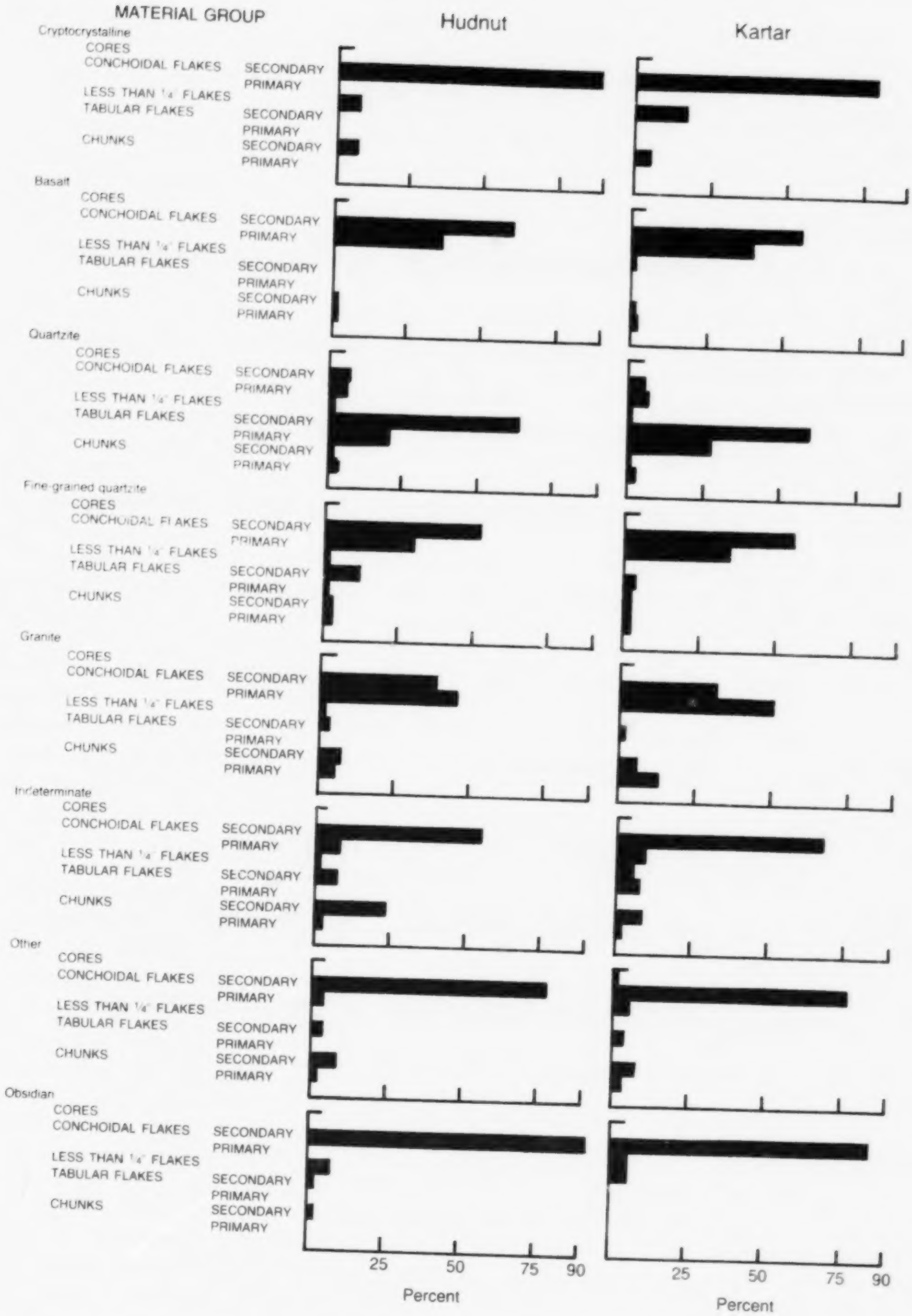

Figure 3-2. Debitage characteristics within eight material groups, 45-OK-11.

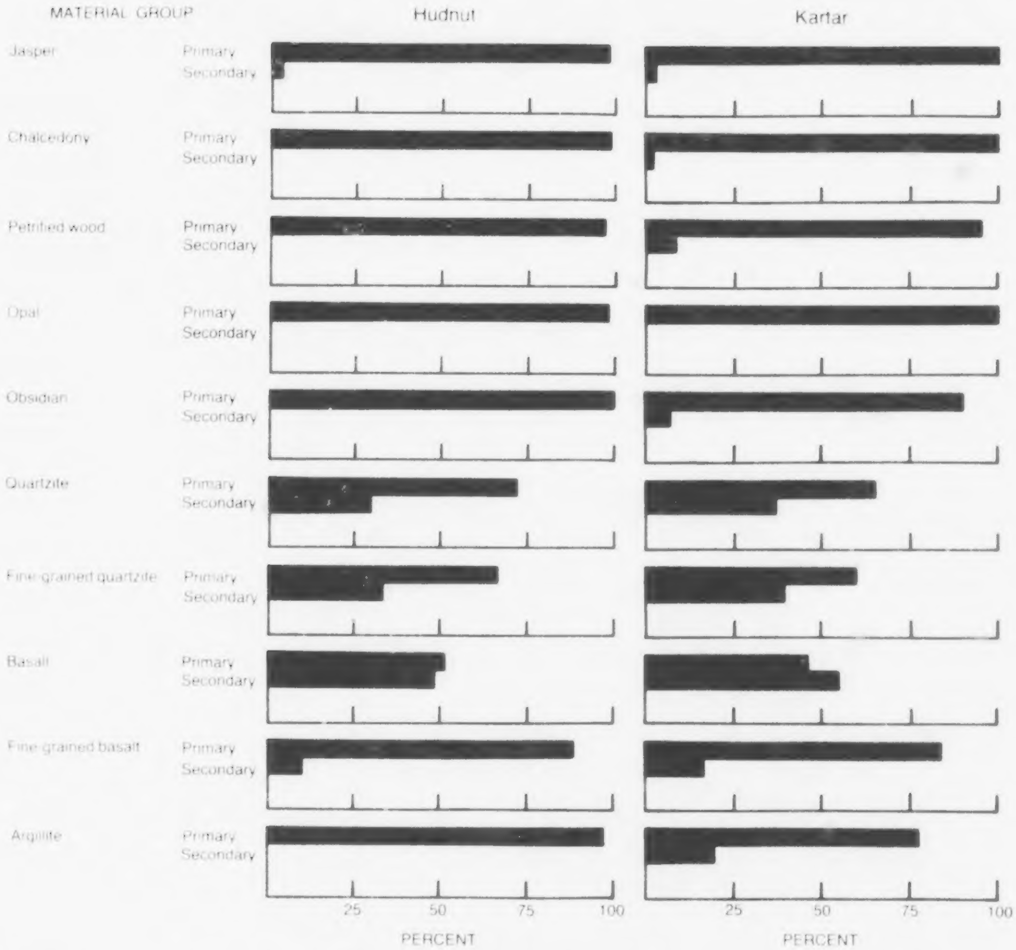

Figure 3-3. Dorsal topography of selected material types, 45-OK-11.

AREAL DISTRIBUTION WITHIN THE KARTAR COMPONENT

We will now examine lithic distributions by reference to cultural features identified within the lower Kartar component. First, we compare artifacts from housepit floors and external living surfaces to those recorded in the general the Kartar component matrix. We then examine the artifact assemblage from two lithic concentrations, Features 33 and 28, that may be chipping stations.

Comparing house floors with the general component matrix (Table 3-4), we find that floors have markedly higher counts of primary flakes with lower proportions of granite and quartzite, and higher percentages of fine-grained quartzite, basalt, other and indeterminate material types. Other debitage categories in the floors are consistent with distributions in the Kartar component fill. All flake tool categories, with the exception of resharpening flakes, which do not occur, are proportionally more frequent on house floors. Some formed tool types are lacking entirely: burins, gravers, pestles, mauls, edge ground cobbles, and net weights. Conversely, choppers are twice as abundant. Unformed tools occur in lower percentages, but include the same forms noted in the Kartar component fill.

Living surfaces contain a smaller proportions of primary conchoidal flakes and secondary conchoidal flakes than either the Kartar component fill or the house floors, but exhibit markedly higher proportions of CCS, <1/4 in flakes and secondary tabular quartzite flakes. Flake tool categories occur in lower percentages on living surfaces than on house floors, comparable to their occurance in the Kartar component fill. Formed tools are proportionally fewer on living surfaces than house floors, but include comparable categories. Unformed tools are uncommon on living surfaces, represented only by hammerstones and millingstones.

Measurements of >1/4 in conchoidal flakes reveal a trend for thicker, wider, and much heavier flakes on house floors, correlative with the higher percentages of primary conchoidal flakes noted above (Table 3-5).

In summary, comparison of artifact assemblages from the Kartar component general fill, house floors, and external living surfaces shows the following distinct patterns. Primary reduction was most common on house floors, particularly reduction of non-cryptocrystalline stones. Secondary reduction resulting in <1/4 in flakes was more common on external living surfaces. Simple utilized flakes and other flake tools as well as choppers were most frequent on house floors. Other formed artifact and unformed artifact types, when present, occur in similar proportions in house floors and living surfaces of the Kartar component general fill.

We also can compare the lithic assemblages described above with those from two lithic concentrations, probably chipping stations, in the Kartar component. Both concentrations are components of exterior occupation surfaces; Feature 33 in Occupation Surface B, and Feature 28 in the occupation surface in the fill above upper Housepit 1 (see Chapter 6). The assemblages from these two features show clear differences in material selection and

Table 3-4. Object type and dorsal topography of lithic materials by cultural context, Kartar component, 45-OK-11.

Material	Object Type	Dorsal Topography	General Fill	House Floors	Living Surfaces	Total
CCS	Debitage					
	Core	None	3	-	2	5
		Indeterminate	1	-	-	1
	Conchoidal flake	None	9,060	764	1,507	10,331
		Partial	70	7	6	83
		Complete	3	1	-	4
		Indeterminate	28	-	3	31
	Tabular flake	None	2	-	-	2
	<1/4-Inch flake	Indeterminate	916	4	1,024	1,944
	Chunk	None	411	46	71	528
		Partial	21	2	1	24
		Indeterminate	17	-	6	23
	Flake Tools					
	Utilized flake	None	116	30	21	167
		Partial	3	-	-	3
		Indeterminate	1	-	1	2
	Linear flake	None	2	-	-	2
	Blade	None	2	2	-	4
	Unifacially retouched flake	None	55	6	5	66
		Partial	3	-	1	4
		Indeterminate	1	-	-	1
	Bifacially retouched flake	None	26	4	4	24
		Partial	1	1	2	4
	Resharpening flake	None	10	-	3	13
	Formed Tools					
	Scraper	None	18	2	2	22
		Partial	1	-	-	1
	Chopper	None	1	-	-	1
	Biface	None	74	8	11	93
		Partial	2	-	-	2
		Indeterminate	1	-	-	1
	Burin	None	2	-	-	2
	Burin spall	None	1	-	-	1
	Graver	None	7	-	-	7
	Drill	None	2	2	-	4
		Indeterminate	1	-	-	1
	Projectile point	None	37	3	3	43
		Partial	2	-	-	2
		Indeterminate	1	-	-	1
	Projectile point base	None	19	1	2	22
	Projectile point	None	21	6	4	31
	Indeterminate	None	1	-	-	1
		Partial	1	-	-	1
Quartzite	Debitage					
	Conchoidal flake	None	203	17	36	256
		Partial	253	9	44	306
		Complete	5	-	2	7
		Indeterminate	-	1	-	1
	Tabular flake	None	1,931	165	960	3,056
		Partial	1,000	124	216	1,340
		Complete	29	8	2	39
		Indeterminate	13	1	1	15
	<1/4-Inch flake	Indeterminate	36	-	2	38
	Chunk	None	35	3	3	41
		Partial	66	5	19	90
		Indeterminate	2	-	-	2

Table 3-4. Cont'd.

Material	Object Type	Dorsal Topography	General Fill	House Floors	Living Surfaces	Total
	Flake Tools					
	Utilized flake	None	1	–	–	1
	Unifacially retouched flake	None	1	1	–	2
	Bifacially retouched flake	Partial	–	–	1	1
		Indeterminate	–	1	–	1
	Formed Tools					
	Chopper	Partial	6	1	1	8
	Tabular knife	None	24	2	6	32
		Partial	59	7	12	75
		Complete	–	–	1	1
		Indeterminate	1	–	–	1
	Projectile point	None	1	–	1	2
	Indeterminate	None	–	–	1	1
		Partial	–	1	–	1
	Unformed Tools					
	Hammerstone	Partial	1	–	–	1
		Complete	2	–	–	2
	Millingstone	Partial	1	–	–	1
Fine-grained Quartzite	Debitage					
	Conchoidal Flake	None	520	93	24	637
		Partial	303	62	16	381
		Complete	2	2	2	6
		Indeterminate	2	–	–	2
	Tabular flake	None	29	1	1	31
		Partial	16	1	–	19
		Complete	1	–	–	1
	<1/4-Inch flake	Indeterminate	6	–	–	6
	Chunk	None	21	1	3	25
		Partial	22	–	6	28
		Indeterminate	1	–	–	1
	Flake Tools					
	Utilized flake	None	3	–	–	3
	Unifacially retouched flake	Partial	1	–	–	1
		Indeterminate	–	1	–	1
	Bifacially retouched flake	None	2	–	–	2
		Indeterminate	–	–	1	1
	Resharpening flake	None	1	–	–	1
	Formed Tools					
	Scraper	None	1	–	–	1
	Chopper	Partial	12	3	2	17
		Complete	–	1	–	1
		Indeterminate	4	–	–	4
	Biface	Partial	2	–	–	2
	Tabular knife	None	1	–	–	1
		Partial	1	–	–	1
	Projectile point	None	2	–	–	2
	Projectile point tip	None	–	1	–	1
	Amorphously flaked cobble	Partial	–	–	1	1
		Indeterminate	1	–	–	1
	Pestle	Indeterminate	1	–	–	1
	Unformed Tools					
	Hammerstone	Partial	3	–	–	3
	Millingstone	Complete	1	–	–	1

Table 3-4. Cont'd.

Material	Object Type	Dorsal Topography	General Fill	House Floors	Living Surfaces	Total
Basalt	Debitage					
	Conchoidal flake	None	3,110	404	164	3,704
		Partial	2,167	348	197	2,712
		Complete	28	6	2	36
		Indeterminate	20	1	1	22
	Tabular flake	None	3	-	-	3
		Partial	3	-	-	3
		Indeterminate	1	-		1
	<1/4-Inch flake	Indeterminate	48	-	6	54
	Chunk	None	85	11	6	102
		Partial	84	25	12	121
		Indeterminate	1	-	-	1
	Flake Tools					
	Utilized flake	None	10	-	-	10
		Partial	-	2	-	2
	Linear flake	None	1	-	-	1
	Unifacially retouched flake	None	3	1	-	4
		Partial	4	4	-	8
	Bifacially retouched flake	None	2	2	1	5
		Partial	2	1	-	3
	Resharpening flake	None	2	-	-	2
	Formed Tools					
	Chopper	None	1	-		1
		Partial	22	5	3	30
		Complete	1	2	-	3
	Biface	None	5	1	1	7
		Partial	2	-	-	2
	Tabular knife	None	1	-	-	1
		Partial	1	-	-	1
	Graver	None	1	-	-	1
	Projectile point	None	11	-	1	12
		Partial	1	-	-	1
		Indeterminate	2	-	-	2
	Projectile point tip	None	2	1	-	3
	Projectile point base	None	2	1	-	3
	Amorphously flaked cobble	Partial	6	1	2	9
		Complete	1	2	-	3
	Peripherally flaked cobble	Partial	1	1	-	2
	Netsinker	Partial	2	-	-	2
	Pestle	Partial	2	-	-	2
	Maul	None	2	-	-	2
	Indeterminate	None	2	-	-	2
		Partial	8	1	-	9
		Complete	1	1	-	2
		Indeterminate	1	1	-	2
	Unformed Tools					
	Hammerstone	Partial	7	2	1	10
		Complete	6	3	1	10
	Edge-ground cobble	Partial	2	-	-	2
	Anvil	Partial	1	-	-	1
		Complete	-	1	-	1
	Hopper mortar base	Complete	-	1	-	1
	Millingstone	Complete	1	-	-	1

Table 3-4. Cont'd.

Material	Object Type	Dorsal Topography	General Fill	House Floors	Living Surfaces	Total
Granitic	Debitage					
	Conchoidal flake	None	36	6	4	46
		Partial	65	4	3	72
		Complete	3	-	-	3
	Tabular flake	None	1	-	-	1
		Partial	1	-	-	1
	<1/4-Inch flake	Indeterminate	-	-	-	-
	Chunk	None	6	1	-	7
		Partial	14	3	1	18
		Indeterminate	1	-	-	1
	Formed Tools					
	Chopper	Partial	1	-	1	2
		Complete	1	-	-	1
	Amorphously flaked cobble	Partial	-	1	-	1
	Peripherally flaked cobble	Partial	2	1	-	3
	Indeterminate	Partial	1	1	-	2
		Complete	1	-	-	1
		Indeterminate	1	1	-	2
	Unformed Tools					
	Hammerstone	None	1	-	-	1
		Partial	3	-	1	4
		Complete	8	3	3	14
	Edge-ground Cobble	Partial	1	-	-	1
	Anvil	Complete	1	1	-	2
	Hopper mortar base	Partial	1	-	-	1
		Complete	-	1	-	1
	Millingstone	Partial	4	3	-	7
		Complete	7	4	2	13
		Indeterminate	2	-	-	2
Obsidian	Debitage					
	Conchoidal flake	None	41	2	4	47
		Partial	3	-	-	3
	<1/4-Inch flake	Indeterminate	3	-	-	3
	Chunk	Indeterminate	3	-	-	3
	Formed Tool					
	Projectile point	None	1	-	-	1
Other	Debitage					
	Core	Partial	1	-	-	1
	Conchoidal flake	None	149	1	1	151
		Partial	8	2	1	11
		Indeterminate	2	-	-	2
	Tabular flake	None	5	-	1	6
		Partial	1	-	-	1
		Indeterminate	1	-	-	1
	<1/4-Inch flake	Indeterminate	1	-	-	1
	Chunk	None	12	-	-	12
		Partial	4	-	-	4
		Indeterminate	8	1	-	9
	Flake Tools					
	Utilized flake	None	1	-	-	1

Table 3-4. Cont'd.

Material	Object Type	Dorsal Topography	General Fill	House Floors	Living Surfaces	Total
	Formed Tools					
	Chopper	Partial	2	-	-	2
	Biface	None	1	-	-	1
	Shaft abrader	Indeterminate	1	-	-	1
	Bead	None	1	-	-	1
	Shaped/incised stone	Indeterminate	7	1	-	8
	Indeterminate	None	1	-	-	1
		Indeterminate	1	-	-	1
Indeterminate	Debitage					
	Conchoidal flake	None	85	-	1	85
		Partial	10	1	1	12
		Complete	1	-	-	1
	Tabular flake	None	7	-	1	8
	<1/4-Inch flake	Indeterminate	7	-	-	7
	Chunk	None	10	-	-	10
		Partial	2	-	-	2
		Indeterminate	2	-	-	2
	Formed Tools					
	Chopper	Partial	2	-	-	2
	Pestle	Partial	1	-	-	1
	Bead	Indeterminate	-	-	1	1
	Shaped/incised stone	Indeterminate	1	-	1	2
	Indeterminate	Complete	-	1	-	1
		Indeterminate	2	2	-	4
	Unformed Tools					
	Hammerstone	Complete	1	-	-	1
	Hopper mortar base	Partial	1	-	-	1
	Millingstone	Partial	1	-	-	1

technique or stage of reduction (Tables 3-6, 3-7, and 3-8). Feature 33 consists primarily of <1/4 in jasper flakes (75%), while Feature 28 contains numerous jasper, chalcedony, and opal flakes, all >1/4 in. Flakes were 93.3% secondary and 5.8% primary in Feature 33 and 94.8% secondary and 5.2% primary in Feature 28. The figure of 5% primary flakes from assemblages representing single reductive events compares to 7% primary CCS flakes in the Kartar component general fill, 9% primary CCS flakes on housepit floors, and 2% primary CCS flakes on external living surfaces. Only 4 flakes from Feature 33 showed signs of heat treatment. In other areas of the site the number of flakes bearing evidence of heating is approximately 3%.

Utilized tools in the lithic concentrations include two resharpened jasper flakes and a single utilized flake from Feature 33, and a jasper projectile point from Feature 28. Whether these products were manufactured in situ and put to immediate use, or whether they were previously utilized tools being repaired here, we cannot determine from the data recorded. While at least 80% of the flakes from both concentrations were classified as broken and usually lacked a distal end; at least 13% were listed as complete in both assemblages. Thus we cannot attribute the low number of tools simply to the fact that the flakes were broken, or badly struck, or of poor material. In the Kartar component fill, 89.9% of the artifact assemblage was unused CCS

Table 3-5. Measurement of conchoidal flakes[1] by cultural context, Kartar component, 45-OK-11.

Measurement	Dorsal Cortex	Material	Statistic	General Fill	House Floors	Living Surfaces	Total
Length (mm)	No	CCS	$\bar{x}$	12.0	12.1	11.4	12.0
			S.D.	5.8	5.3	5.4	5.7
			N	4,143	479	665	5,287
	No	Other	$\bar{x}$	14.2	15.1	13.2	14.2
			S.D.	7.7	9.3	6.3	7.8
			N	1,571	213	116	1,900
	Yes	CCS	$\bar{x}$	16.4	22.5	14.5	18.5
			S.D.	9.4	17.7	6.2	9.4
			N	40	2	4	46
	Yes	Other	$\bar{x}$	24.4	23.4	26.0	24.4
			S.D.	14.0	15.0	17.8	14.7
			N	2,006	266	191	2,463
Thickness (.1 mm)	No	CCS	$\bar{x}$	19.1	33.9	18.8	19.2
			S.D.	13.5	27.1	16.5	14.1
			N	2,957	27	421	3.405
	No	Other	$\bar{x}$	26.5	26.0	19.4	24.5
			S.D.	20.1	13.5	13.6	16.7
			N	2,460	80	972	3,512
	Yes	CCS	$\bar{x}$	36.4	–	31.2	35.3
			S.D.	19.9	–	16.6	19.1
				24	–	6	30
	Yes	Other	$\bar{x}$	60.6	71.8	51.5	59.4
			S.D.	43.6	81.0	42.1	46.1
			N	1,510	90	379	1,979
Width (mm)	No	CCS	$\bar{x}$	10.9	16.0	10.3	10.9
			S.D.	6.3	10.3	6.7	6.5
			N	1,956	21	197	2,174
	No	Other	$\bar{x}$	13.9	17.1	16.1	14.0
			S.D.	8.6	6.9	12.3	8.7
				913	17	22	952
	Yes	CCS	$\bar{x}$	15.8	0.0	21.5	16.8
			S.D.	8.3	0.0	17.2	10.1
			N	19	0	4	23
	Yes	Other	$\bar{x}$	29.0	37.7	28.4	29.1
			S.D.	17.6	21.3	19.0	18.0
			N	655	19	136	810
Weight (gm)	No	CCS	$\bar{x}$	4.7	18.0	4.0	4.8
			S.D.	80.3	22.0	16.1	75.9
			N	4,457	51	518	5,026
	No	Other	$\bar{x}$	13.5	31.3	7.8	12.6
			S.D.	58.4	119.1	33.3	55.9
			N	3,313	91	984	4,388
	Yes	CCS	$\bar{x}$	14.3	4.0	53.2	20.2
			S.D.	25.5	0.0	74.3	39.0
			N	42	1	8	51
	Yes	Other	$\bar{x}$	106.7	218.2	79.0	106.6
			S.D.	274.6	569.2	248.3	290.4
			N	1,740	99	413	2,252

[1] < 1/4-Inch flakes excluded.

Table 3-6. Artifact types from Features 33 and 28, 45-OK-11.

Material	Object Type	Dorsal Topography	Feature 33	Feature 28	Total
CCS	Debitage				
	Conchoidal flake	None	292	328	620
		Indeterminate	3	-	3
	<1/4-in flake	Indeterminate	988	-	988
	Chunk	None	13	18	31
		Indeterminate	5	-	5
	Flake Tools				
	Unifacially retouched flake	None	1	-	1
	Resharpening flake	None	2	-	2
	Formed Tools				
	Projectile point	None	-	1	1
Quartzite	Debitage				
	Tabular flake	None	1	1	2
Basalt	Debitage				
	Conchoidal flake	None	3	-	3

Table 3-7. Count of flake size by material, 45-OK-11.

Material	Size (in)	Feature 33	Feature 28	Total
Jasper	>1/4	316	206	522
	<1/4	249	-	249
	<1/8	731	-	731
Chalcedony	>1/4	-	23	23
	<1/4	1	-	1
	<1/8	7	-	7
Opal	>1/4	-	119	119
Quartzite	>1/4	1	1	2
	<1/4	1	-	1
Basalt	>1/4	1	-	1
	<1/4	1	-	1
Fine-grained Basalt	>1/4	2	-	2
	<1/4	4	-	4
Total	>1/4	320	349	669
	<1/4	255	-	255
	<1/8	739	-	739

Table 3-8. Measurement of conchoidal flakes in Features 33 and 28, Kartar component, 45-OK-11.

Measuremnt	Material	Statistic	Feature 33	Feature 28	Total
Length (mm)	Jasper	$\bar{x}$	10.4	6.7	9.5
		s.d.	3.8	2.4	3.9
		N	116	36	152
	Chalcedony	$\bar{x}$	–	10.0	10.0
		s.d.	–	2.7	2.7
		N	–	8	8
	Opal	$\bar{x}$	–	12.2	12.2
		s.d.	–	5.2	5.2
		N	–	75	57
	Fine-grained basalt	$\bar{x}$	8.0	–	8.0
		s.d.	–	–	–
		N	1	–	1
Thickness (.1 mm)	Jasper	$\bar{x}$	18.5	–	18.5
		s.d.	12.7	–	12.7
		N	276	–	276
	Opal	$\bar{x}$	–	67.5	67.5
		s.d.	–	31.6	31.6
		N	–	4	4
	Quartzite	$\bar{x}$	21.0	–	21.0
		s.d.	–	–	–
		N	1	–	1
	Basalt	$\bar{x}$	17.0	–	17.0
		s.d.	–	–	–
		N	1	–	1
	Fine-grained basalt	$\bar{x}$	12.0	–	12.0
		s.d.	2.8	–	2.8
		N	2	–	2
Width (mm)	Jasper	$\bar{x}$	8.3	–	8.3
		s.d.	3.1	–	3.1
		N	101	–	101
	Opal	$\bar{x}$	–	13.0	13.0
		s.d.	–	5.1	5.1
		N	–	4	4
	Basalt	$\bar{x}$	14.0	–	14.0
		s.d.	–	–	–
			1	–	1
Weight (gm)	Jasper	$\bar{x}$	1.5	–	1.5
		s.d.	1.7	–	1.7
		N	316	–	316
	Opal	$\bar{x}$	–	14.0	14.0
		s.d.	–	14.6	14.6
		N	–	5	5
	Quartzite	$\bar{x}$	3.0	–	3.0
		s.d.	–	–	–
		N	1	–	1
	Basalt	$\bar{x}$	2.0	–	2.0
		s.d.	–	–	–
		N	1	–	1
	Fine-grained basalt	$\bar{x}$	1.0	–	1.0
		s.d.	–	–	–
		N	2	–	2

flakes compared to 4.1% CCS tools, while on house floors 87% was unused flakes and 7.3% tools, and on external living surfaces 94.7% was unused flakes and 3.2% tools.

In the lithic concentrations described above, we have a large collection of primary and secondary debitage, most likely produced during two reductive events, and a few tools which may be end products. Although we cannot know how many tools were created and taken elsewhere or how many flakes were further reduced elsewhere, it does seem that reduction was somewhat wasteful and that the knapper was simply selecting the best flakes out of a number struck. Carefully shaped cores are lacking, although some of the artifacts identified as chunks could very well be spent cores.

Comparison of artifact assemblages from house floors, external living surfaces, chipping concentrations, and general Kartar component fill indicate a very similar range of lithic reduction activities across the site. We can conclude that knapping was common in dwellings, that basalt and fine-grained quartzite were a favored material, that flakes were often reduced from the parent cobbles, and that the production and maintenance of formed tools was a characteristic. The two chipping stations--composed of primary and secondary flakes with amorphous chunks and a relative lack of tools--show us what prehistoric knapping events look like as they are preserved in the archaeological record. Of the other cultural contexts, house floors are the most distinctive; assemblages from external living surfaces are more similar to the general Kartar component fill. In comparison with house floors, living surfaces have lower percentages of primary and secondary conchoidal flakes and a more limited range of formed tools in lower percentages. Secondary tabular quartzite flakes and <1/4 in flakes, on the other hand, are relatively more numerous. The distinction between house floors and other features is illustrated by the average thickness and weight of flakes (Figure 3-4). In both the CCS and basalt categories, we see reflected a greater emphasis on primary reduction on house floors.

The prevalence of primary reduction on house floors may be indirect evidence of winter occupation of dwellings and more year-round use of other features. More activity in general would occur on house floors in inclement weather, and that this might be reflected in a pattern of higher percentages of primary reduction indicators as outlined above--assuming that we would normally get a greater separation of tool production and tool use across the site in better weather (e.g., lithic concentration Feature 28 and 33). We would not necessarily expect to see higher percentages of tool production nor evidence of tool maintenance, since these remains would be more directly related to tasks and not the need for shelter, which acts to concentrate activities not otherwise associated. In fact, we do find greater evidence for resharpening and tool finishing activities on external living surfaces. It is interesting to speculate that technological diversity in lithic assemblages of the Kartar component may provide evidence for seasonality.

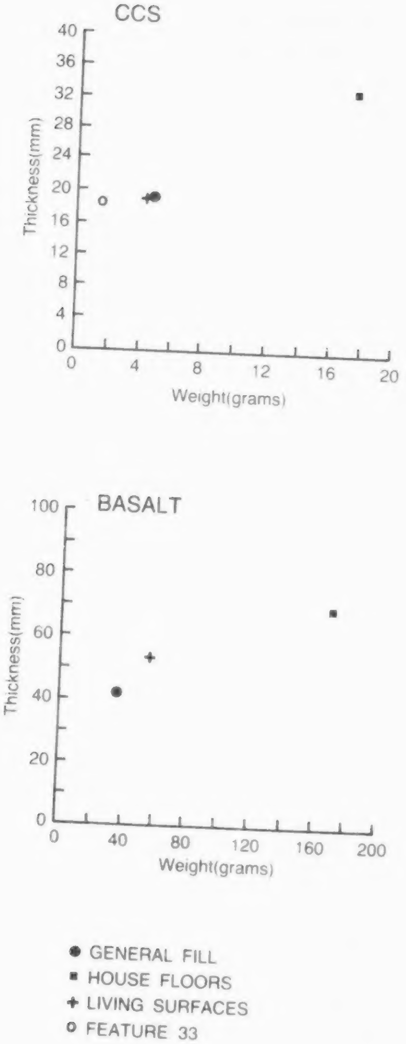

Figure 3-4. Technologic diagnostics of cultural features. (Weight and thickness measurements were not available for Feature 28).

INDUSTRIES

Stone industries can be defined as material-directed (e.g., a basalt industry) or as technique-directed (e.g., a blade industry). At 45-OK-11 we have evidence of two major material industries: cryptocrystalline and non-cryptocrystalline. Crosscutting these material industries are four technique-directed industries: a generalized flake tool industry, a blade industry, a cobble tool industry, and a poorly represented microblade industry.

Two major material groups (CCS, non-CCS) were all reduced through a generalized flake tool technology, but each group's structural properties preserve the distinctiveness of the product. CCS stones had to be transported to the site from some distance, usually in the form of blanks and preforms or partially reduced flakes, although we did recover a number of probable cores. Most non-CCS stone occurs locally as elements of the Columbia River gravels. These material types exhibit higher proportions of flakes and other artifact types with cortex, indicating reduction on the site area proper. At least one core was recovered. Both of these major material groups are well-represented by all stages of the reduction process discussed previously: cores and other debitage including both primary and secondary flakes, and a wide variety of flake tools and formed tools. Within the non-CCS materials, the common variety of quartzite (not fine-grained), which fractures in flat, tabular planes, and is abundant on the gravel terraces abutting the river, is distinctive in the lithic assemblage. These tabular flakes commonly exhibit cortex remnants in much higher proportion than any other material type. The range of potential quartzite products is more limited than for other materials: most artifacts classified as quartzite are tabular knives, utilized, retouched flakes or resharpening flakes. As tabular quartzite was readily obtainable, and easily reduced into a handy tabular flake, one might argue that the material was used opportunistically, the flakes being adapted to tasks of the moment. However, tabular knives are specialized tools which show little diversity in wear (see functional analysis).

One technique-directed industry is a generalized flake tool technology, wherein lamellar flakes were struck from unprepared cores. Represented in the assemblage by, primary and secondary debitage, and a wide range of tool types, this form of reduction was the common technique in both cultural components.

Another technique of reduction, which has been termed Levallois-like (cf., Leonhardy 1970; Leonhardy and Muto 1972; and Muto 1976), involved the production of blades from prepared cores. Evidence for this technique is almost exclusively confined to the Kartar component and consists of four blades, a large collection of projectile points which appear to have been made on blades, and several blade tools. The lack of a full range of evidence that demonstrate the use of this technique is puzzling, since we do have the most obvious end products. Perhaps this technique was not often carried out on the site; rather, blades might have been carried there and made into tools, some of which we can recognize as products of this technique. Another possibility is simply that blades, unlike the more common conchoidal flakes, seldom were left unused, and are difficult to identify in fully reduced artifact types other than projectile points.

A third industry, an extensive cobble tool industry in the lower Kartar component, used several material types, of which basalt and granite were the most common. Formed tools were created by flaking, pecking or grinding selected nodules or cobbles (e.g., flaked cobbles, pestles, mauls, edge-ground cobbles). Unformed tools were also manufactured by partially modifying appropriate cobble forms. These generally were not reduced to any appreciable extent. Rather, the whole cobble was modified to produce the desired tool. A fuller discussion of these forms is presented in the Stylistic Analysis section.

A fourth technique-directed industry may be indicated by the presence of a small number linear flakes that maybe microblades. Several examples were found in both cultural components, and similar forms have been found in association with good microblade cores on other sites in the project area (Lohse 1984d, 1984e). However, similar linear flakes can be produced as a fortuitous byproduct within the more common flake tool industry. In the absence of a large collection, and, most particularly, definite microblade cores, we cannot be certain of the presence of this industry at this site (cf., Sanger 1967, 1969, 1970b).

Assemblages in the lower Kartar Phase component contain evidence of similar reductive techniques, but contain different tool types, and, quite possibly, indicate distinct activities occurring in different areas of the site. Certain material types appear to be concentrated in different areas--again, this may be due to the nature of activities taking place.

FUNCTIONAL ANALYSIS

Functional analysis examines the physical characteristics of artifacts in order to identify patterns of wear diagnostic of specific tool uses. Past research has pointed out the possibility of interpreting tool use by examining edge damage and general attrition of working surfaces (e.g., Crabtree 1973; Frison 1968; Keeley 1974, 1978; Odell 1977; Semenov 1964; Stafford and Stafford 1979; Wilmsen 1968, 1970). Wear patterns have been shown to reveal both the manner of tool use and the nature of the materials worked.

All artifacts were examined with a 10X hand-lens (cf. Hayden 1979; Stafford and Stafford 1979). During analysis, each artifact was classified as to tool shape, wear or surface damage, and edge angle. Making use of established correlations between specific wear patterns on certain materials and types of tool use, we can hypothesize the intended and actual use of collected tools. Most distinctions will be based on hardness--on the nature of edge attrition given softer and harder working mediums.

The classificatory dimensions used in functional analysis are shown in Table 3-9. Some of these dimensions describe objects, and others describe tools on objects. It should be noted that an object may have a number of tools, and unless otherwise specified, counts in the following tables will be tool-specific rather than object-specific (i.e., the number of tool types can

Table 3-9. Functional dimensions.

DIMENSION I: UTILIZATION/MODIFICATION

- None
- Wear only
- Manufacture only
- Manufacture and wear
- Modified/indeterminate
- Indeterminate

DIMENSION II: TYPE OF MANUFACTURE

- None
- Chipping
- Pecking
- Grinding
- Chipping and pecking
- Chipping and grinding
- Pecking and grinding
- Chipping, pecking, grinding
- Indeterminate/not applicable

DIMENSION III: MANUFACTURE DISPOSITION

- None
- Partial
- Total
- Indeterminate/not applicable

DIMENSION IV: WEAR CONDITION

- None
- Complete
- Fragment

DIMENSION V: WEAR/MANUFACTURE RELATIONSHIP

- None
- Independent
- Overlapping - total
- Overlapping - partial
- Independent - opposite
- Indeterminate/not applicable

DIMENSION VI: KIND OF WEAR

- Abrasion/grinding
- Smoothing
- Crushing/pecking
- Polishing

DIMENSION VI: Continued

- Feathered chipping
- Feathered chipping/abrasion
- Feathered chipping/smoothing
- Feathered chipping/crushing
- Feathered chipping/polishing
- Hinged chipping
- Hinged chipping/abrasion
- Hinged chipping/smoothing
- Hinged chipping/crushing
- Hinged chipping/polishing
- None

DIMENSION VII: LOCATION OF WEAR

- Edge only
- Unifacial edge
- Bifacial edge
- Point only
- Point and unifacial edge
- Point and bifacial edge
- Point and any combination
- Surface
- Terminal surface
- None

DIMENSION VIII: SHAPE OF WORN AREA

- Not applicable
- Convex
- Concave
- Straight
- Point
- Notch
- Slightly convex
- Slightly concave
- Irregular

DIMENSION IX: ORIENTATION OF WEAR

- Not applicable
- Parallel
- Oblique
- Perpendicular
- Diffuse
- Indeterminate

DIMENSION X: OBJECT EDGE ANGLE

- Actual edge angle

exceed the number of artifacts recovered). The initial focus of the following discussion is on functional object types and then proceeds from the object to examination of tools on the object. Manufacture Type is carried over from the technological analysis section in two introductory tables to define clearly the relationship of Wear/Manufacture and Functional Type. After that, tables include only dimensions used in the Functional Analysis.

Table 3-10 lists lithic and non-lithic artifact types recovered from the two cultural components. Lithic types are those discussed previously as products of tool manufacture. Non-lithic types are combination functional-morphological labels, and will be discussed in the Stylistic Analysis section.

As shown, there is very little difference in the proportion of lithic artifact types in either cultural component. At least 95% of each assemblage consists of unworn flakes, chunks, or other debitage. Flake tools, predominantly simple utilized flakes, comprise the most frequent tool types, with the exception of a large number of choppers in the Kartar component. In general, the Kartar component includes more coarse formed and unformed tools such as choppers, hammers, flaked cobbles, milling stones, anvils, and hopper bases. Finally non-lithic artifact types occur in much higher frequencies in the Kartar component, and in much greater variety, although they do not comprise a high proportion of the tool types.

Tables 3-11 and 3-12 show the relationship among functional object types, wear/manufacture, and type of manufacture. The first table lists formed objects, those that have been shaped for a specific use or to a common form. The second table lists modified objects, artifacts that have not been shaped to any great extent, although they may exhibit resharpening of an edge or surface.

At least 95% of all formed types in both components were made by chipping. In the Kartar component, 1.3% (N=8) were not manufactured and 1.4% (N=9) could not be classified. In the Hudnut component, 2.2% (N=8) were not manufactured and 2.7% (N=10) could not be classified. Over 97% of the artifact types in both components show either manufacture only or manufacture and wear, with the Kartar component having proportionately more artifacts with manufacture and wear (Kartar component=41.1%, Hudnut component=34.3%).

The majority of modified artifact types show no evidence of manufacture (Kartar component=55.7%, Hudnut component=60.5%,). Those that do show manufacture are chipped (Kartar component=37%, Hudnut component=37.1%) or classified as indeterminate (Kartar component=7.1%, Hudnut component=2.2%). A single pecked/ground specimen was recorded in the Kartar component. Most objects show wear only (Kartar component=67.6%, Hudnut component=59%) or wear and manufacture (Kartar component=27.8%, Hudnut component=23.7%). Manufacture only makes up a much smaller percentage in both components (Kartar component=19.5%, Hudnut component=13.5%). Modified/Indeterminate forms total 9.1% in the Kartar component and 2.2% in the Hudnut component.

The wear analysis is tool-specific, that is, each occurrence of wear is described separately. For example, a biface may have several areas of wear indicative of similar or distinct uses. Identification of these wear areas is based on the analysts' perception of separation: if wear is continuous along a

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Table 3-10. Count of functional types by component, 45-OK-11.

Artifact Type	Hudnut Component	Kartar Component	Total
Lithic			
Core	4	9	13
Utilized flake	196	183	381
Unifacially retouched flake	76	87	163
Bifacially retouched flake	53	49	102
Resharpening flake	9	16	25
Blade	1	4	5
Linear flake	2	3	5
Scraper	12	24	36
Biface	104	107	211
Tabular knife	69	116	185
Burin	2	2	4
Burin spall	2	1	3
Graver	15	8	23
Drill	4	5	9
Projectile point	53	64	117
Projectile point base	22	24	46
Projectile point tip	52	33	85
Chopper	18	204	222
Maul	1	2	3
Hammerstone	34	47	81
Edge-ground cobble	1	3	4
Pestle	2	3	5
Millingstone	4	25	29
Anvil	-	4	4
Hopper mortar base	-	4	4
Peripherally flaked cobble	-	5	5
Amorphously flaked cobble	1	16	17
Netsinker	1	2	3
Shaft abrader	2	1	3
Bead	5	3	8
Shaped/incised siltstone	3	10	13
Indeterminate	13	31	44
Unworn/unmodified	22,978	23,876	46,854
Subtotal	23,741	24.971	48.712
Non-lithic			
Bone bead	-	2	2
Shell bead	-	3	3
Composite harpoon	-	1	1
Composit harpoon-valve	-	1	1
Unbarbed harpoon point	1	-	1
Round cross-section bipoint	-	1	1
Flat cross-section bipoint	-	1	1
Needle	1	2	3
Shuttle	-	2	2
Awl	-	15	15
Chisel	-	3	3
Wedge	1	15	16
Pendant	-	1	1
Point	2	4	6
Pointed fragment	22	47	69
Articular end	-	6	6
Edged end	1	3	4
Squared/rounded end	2	1	3
Blunted end	-	2	2
Formed shaft fragment	1	-	1
Flaked long bone	3	12	15
Other formed fragment	14	45	59
Technologically modified object	34	73	107
Formed object	3	17	20
Dentalium	-	1	1
Olivella	-	3	3
Indeterminate	7	8	15
Subtotal	92	269	361
Total	23,824	25,239	49,063

Table 3-11. Utilization/modification and type of modification by object type and component, 45-OK-11.

Type	Utilization/ Modification[1]	Type of Manufacture[2]	Kartar Component	Hudnut Component
Projectile point	3	2	49	46
Projectile point	4	2	15	7
Projectile point base	3	2	20	21
Projectile point base	4	2	4	1
Projectile point tip	3	2	33	49
Projectile point tip	4	2	–	4
Bifacially retouched flake	3	2	84	82
Bifacially retouched flake	4	2	23	22
Amorphously flaked cobble	3	2	14	–
Amorphously flaked cobble	4	2	2	1
Burin	3	2	–	1
Burin	4	2	2	1
Chopper	2	1	1	–
Chopper	3	2	103	9
Chopper	4	2	100	9
Drill	2	1	2	1
Drill	3	2	1	2
Drill	4	2	2	1
Graver	2	1	3	6
Graver	4	2	5	9
Maul	5	9	2	1
Netsinker	4	2	1	–
Netsinker	5	9	1	1
Pestle	2	1	1	1
Pestle	5	5	3	1
Peripherally flaked cobble	3	2	4	–
Peripherally flaked cobble	4	2	1	–
Scraper	4	2	24	12
Shaft abrader	5	5	1	2
Tabular knife	2	1	1	–
Tabular knife	3	2	39	11
Tabular knife	4	2	76	58
Bead	5	9	3	5
Total			620	364

[1] Utilization/ Modification
1. None
2. Wear only
3. Manufacture only
4. Manufacture and Wear
5. Modified/Indeterminate
6. Indeterminate

[2] Type of Manufacture
1. None
2. Chipping
3. Pecking
4. Grinding
5. Chipping and Pecking
6. Chipping and Grinding
7. Pecking and Grinding
8. Chipping, Pecking and Grinding
9. Indeterminate

Table 3-12. Utilization/modification and type of modification by object type and component, 45-OK-11.

Type	Utilization/ Modification[1]	Type of Manufacture[2]	Kartar Component	Hudnut Component
Anvil	2	1	4	–
Edge-ground anvil	4	7	–	1
Edge-ground anvil	5	9	3	–
Hammerstone	2	1	41	34
Hammerstone	4	2	6	–
Hopper mortar base	2	1	3	–
Hopper mortar base	4	2	1	–
Millingstone	2	1	16	1
Millingstone	3	2	5	2
Millingstone	4	2	4	1
Shaped/Incised object	2	1	–	1
Shaped/Incised object	5	9	10	2
Burin spall	1	1	–	1
Burin spall	3	2	1	1
Blade	1	1	1	–
Blade	2	1	2	–
Blade	4	2	1	1
Linear flake	1	1	3	1
Linear flake	2	1	–	1
Core	1	1	9	4
Resharpening flake	3	2	11	4
Resharpening flake	4	2	5	5
Bifacially retouched flake	3	2	27	36
Bifacially retouched flake	4	2	22	17
Unifacially retouched flake	2	1	–	1
Unifacially retouched flake	3	2	27	9
Unifacially retouched flake	4	2	61	36
Utilized flake/chunk	2	1	183	197
Utilized flake/chunk	4	2	–	1
Indeterminate	2	1	4	1
Indeterminate	3	2	2	2
Indeterminate	4	2	4	3
Indeterminate	3	9	21	7
Total			477	400

[1] Utilization/Modification
1. None
2. Wear only
3. Manufacture only
4. Manufacture and Wear
5. Modified/Indeterminate
6. Indeterminate

[2] Type of Manufacture
1. None
2. Chipping
3. Pecking
4. Grinding
5. Chipping and Pecking
6. Chipping and Grinding
7. Pecking and Grinding
8. Chipping, Pecking and Grinding
9. Indeterminate

surface or edge, it is considered one tool if, however, wear areas appear separated by a stretch of unworn edge or surface, they are considered separate tools. Table 3-13 shows the number of wear areas per object, the number of objects per wear area, the ratio of number of wear areas to object types, and tabulation of these by component.

Projectile points, bifaces, tabular knives, bifacially, retouched flakes and resharpening flakes show consistently low wear area ratios. Choppers, in the Kartar component, also have low wear area ratios. Those artifacts with higher ratios include scrapers, gravers, drills, and hammerstones. The zonal distributions are very regular.

Tool-specific wear attributes for each dimension are listed in the order found in Table 3-9, presented previously. Most dimensions and attributes are relatively straightforward. LOCATION OF WEAR, however, needs som exposition. Wear listed as "edge only" is confined to the cutting edge of the object, and does not extend onto any adjoining surface. Wear listed as "point only" is confined to a narrow constriction, and does not extend along adjoining surfaces or edges. Wear listed as "surface" does not extend off the surface to lateral edges or margins. If a bifacially retouched object has wear on only one face of the edge, the location is identified as "unifacial edge." Conversely, a unifacially retouched object with wear on both manufactured and unmanufactured faces of the edge will be classified as "bifacial edge." EDGE ANGLE is listed in arbitrary 30 degree intervals.

In Table 3-14, KIND OF WEAR, LOCATION OF WEAR, and grouped EDGE ANGLE are listed for each functional object type, and tabulated by cultural component. As shown, analysis of wear area type, location and edge angle, generally reinforce assumptions implicit in the identification of traditional functional types. These do in effect correspond to certain kinds of uses. Smaller tools exhibit combinations of smoothing and feathered chipping wear on edges and points, indicative of light cutting, scraping, and perforating uses. Tabular knives (98%) show almost entirely smoothing wear on edges. Other object types show very little smoothing wear, whether alone or in combination with other wear types. Burins (100%), gravers (74%), utilized flakes (68%) and bifacially retouched flakes (32%) commonly have feathered chipping wear. Other small tools exhibit hinged chipping wear on edges and points indicative of heavier cutting, scraping, and perforating uses. Drills (73%), bifaces (72%), unifacially retouched flakes (72%), resharpening flakes (72%), scrapers (68%), bifacially retouched flakes (65%) commonly have hinged chipping wear, usually occurring alone, but also in combination with abrasion, smoothing, and crushing. Larger tools generally show crushing or pecking wear indicative of much heavier cutting and pounding uses. Milling stones (100%), hopper bases (100%), anvils (100%), hammerstones (99%), and choppers (86%) show massive attrition of surfaces and edges.

Specific functional object types were used for a variety of purposes, not necessarily described by the attached functional type label. Projectile points were multi-purpose tools, with wear evidencing use as cutting and scraping implements in much the same way as bifaces, linear flakes, tabular knives, resharpened, retouched, and simple utilized flakes. Tabular knives

Table 3-13. Wear area: object ratio by functional type and component, 45-OK-11.

Functional Type	N of Wear Areas	Hudnut Component		Kartar Component		Wear Area/ Object
		Object Frequency	Wear Area/ Object	Object Frequency	Wear Area/ Object	
Utilized flake	1	105	300/183=1.64	117	315/198=1.59	615/381=1.61
	2	51		56		
	3	18		17		
	4	6		6		
	5	3		1		
	6	-		1		
Unifacially retouched flake	-	26	116/88=1.32	9	130/76=1.71	246/164=1.50
	1	30		36		
	2	16		12		
	3	11		18		
	4	4		6		
	5	1		2		
	6	-		1		
Bifacially retouched flake	-	27	41/49=0.837	36	31/53=0.585	71/102=0.699
	1	10		9		
	2	7		3		
	3	3		4		
	4	2		1		
Resharpening flake	-	11	7/16=0.437	4	6/9=0.667	13/25=0.520
	1	3		4		
	2	2		1		
Blade	-	1	7/4=1.75	-	2/1=2.00	9/5=1.80
	2	2		1		
	3	1		-		
Linear flake	-	3	1/3=0.333	1	1/2=0.500	2/5=0.400
	1	-		1		
Scraper	1	4	65/24=2.71	1	30/12=2.50	92/35=2.63
	2	7		5		
	3	6		5		
	4	6		1		
	5	1		0		
Biface	-	84	30/107=0.280	82	37/104=0.356	67/211=0.317
	1	16		11		
	2	4		9		
	3	-		1		
	4	1		-		
	5	-		1		
Tabular knife	-	39	113/116=0.974	11	71/69=1.03	184/185=0.994
	1	45		47		
	2	28		9		
	3	4		2		
Burin	-	-	3/2=1.50	1	2/2=1.00	5/4=1.25
	1	1		-		
	2	1		1		
Burin spall	-	1	0/1=0	2	0/2=0	0/3=0
Graver	1	2	23/8=2.87	7	27/15=1.80	50/23=2.17
	2	2		5		
	3	1		2		
	4	2		1		
	6	1		-		

Table 3-13. Cont'd.

Functional Type	N of Wear Areas	Hudnut Component		Kartar Component		Wear Area/ Object
		Object Frequency	Wear Area/ Object	Object Frequency	Wear Area/ Object	
Drill	-	1	11/5=2.20	2	4/4-1.00	15/9-1.67
	1	-		1		
	2	1		-		
	3	3		1		
Projectile point	-	102	29/121=0.240	116	19/128=0.146	48/245=0.193
	1	10		7		
	2	8		4		
	3	1		-		
	4	-		1		
Chopper	-	103	217/204=1.06	9	20/18=1.11	237/222=1.07
	1	42		3		
	2	27		2		
	3	16		3		
	4	10		1		
	5	3		-		
	6	3		-		
Maul	-	2	0/2=0	1	0/1=0	0/3=0
Hammerstone	1	24	91/47=1.94	16	56/34=1.70	149/81=1.84
	2	13		13		
	3	4		4		
	4	3		1		
	5	1		1		
	6	2		1		
Edge-ground cobble	-	3	1/3=0.333	-	1/1=1.00	2/4=0.500
	1	-		1		
Pestle	-	3	2/4=0.500	1	2/2=1.00	4/6=0.667
	2	1		1		
Millingstone	-	5	20/25=0.800	2	2/4=0.500	22/29=0.759
	1	20		2		
Anvil	1	4	4/4=1.00	-	-	4/4=1.00
Hopper mortar base	1	4	1/4=0.250	-	-	1/4=0.250
Peripherally flaked cobble	-	4	1/5=0.200	-	-	1/5=0.200
	1	1				
Amorphously flaked cobble	-	14	3/16=0.187	-	2/1=2.00	5/17-0.294
	1	2		-		
	2	-		1		
Netsinker	-	1	2/2=1.00	1	0/1=0	2/3=0.667
	2	1		-		
Sharpening/Incised siltstone	-	10	3/10=0.300	2	3/3=1.00	6/13=0.461
	3	-		1		
Indeterminate	-	23	32/31=1.03	9	6/13=0.461	38/44=0.864
	1	-		2		
	2	3		2		
	4	2		-		
	6	3		-		

Table 3-14. Wear variable by formal type and component, 45-OK-11.

Formal Type and Wear Variables	Hudnut Component	Kartar Component	Total
Utilized Only			
Kind of Wear			
Fethered chipping	200	215	415
Feathered chipping/ smoothing	3	–	3
Hinged chipping	112	84	196
Hinged chipping/ smoothing	–	1	1
Location of Wear			
Unifacial edge	297	274	571
Bifacial edge	17	23	40
Point only	1	1	2
Point and unifacial edge	–	2	2
Grouped Edge Angle			
1-30 Degrees	239	221	460
31-60 Degrees	70	73	143
> 60 Degrees	6	6	12
Unifacially Retouched Flake			
Kind of Wear			
Smoothing	2	–	2
Crushing-Pecking	1	2	3
Feathered chipping	31	32	63
Feather chipping/ smoothing	1	1	2
Hinged chipping	93	72	165
Hinged chipping/abrasion	–	1	1
Hinged chipping/ smoothing	2	6	8
Hinged Chipping/ crushing	–	2	2
Location of Wear			
Edge only	2	–	2
Unifacial edge	114	107	221
Bifacial edge	11	9	20
Point and unifacial edge	1	–	1
Point and two edges	2	–	2
Grouped Edge Angle			
1-30 Degrees	30	38	68
31-60 Degrees	81	66	147
> 60 Degrees	18	12	30
Indeterminate	1	–	1
Bifacially Retouched Flake			
Kind of Wear			
Abrasion/Grinding	–	2	2
Feathered chipping	11	9	20
Feathered Chipping/ smoothing	1	–	1
Feathered Chipping/ crushing	2	–	2
Hinged Chipping	16	26	44
Hinged Chipping/	1	2	3
smoothing	1	2	3
Location of Wear			
Unifacial edge	23	23	56
Bifacial edge	6	8	16
Grouped Edge Angle			
1-30 Degrees	8	6	14
31-60 Degrees	13	25	44
> 60 Degrees	4	10	14

Table 3-14. Cont'd.

Type Wear	Hudnut Component	Kartar Component	Total
Resharpening Flake			
Kind of Wear			
Feathered chipping	1	2	3
Hinged chipping	5	5	10
Location of Wear			
Unifacial edge	5	6	11
Bifacial edge	1	1	2
Grouped Edge Angle			
1-30 Degrees	2	2	4
31-60 Degrees	4	5	9
Linear Flake			
Kind of Wear			
Feathered chipping	1	3	4
Hinged cHipping	2	4	6
Location of Wear			
Unfacial Edge	3	7	10
Grouped Edge Angle			
1-30 Degrees	3	6	9
31-60 Degrees	–	1	1
Scraper			
Kind of Wear			
Abrasion/Grinding	–	2	2
Smoothing	2	3	5
Feathered chipping	2	17	19
Feathered chipping/ abrasion	–	1	1
Feathered chipping/ smoothing	–	2	2
Hinged chipping	15	31	46
Hinged chipping/ abrasion	1	2	3
Hinged chipping/ smoothing	10	7	17
Location of Wear			
Edge only	2	3	5
Unifacial edge	28	54	82
Bifacial edge	–	7	7
Point and two edges	–	1	1
Grouped Edge Angle			
1-30 Degrees	7	6	13
31-60 Degrees	21	46	67
> 60 Degrees	2	13	15
Biface			
Kind of Wear			
Smoothing	4	1	5
Feathered chipping	8	3	11
Feathered Chipping/ smoothing	1	2	3
Hinged chipping	23	18	41
Hinged chipping/ smoothing	1	3	4
Hinged chipping/ crushing	–	3	3
Location of Wear			
Edge only	4	1	5
Unifacial edge	26	22	48
Bifacial edge	5	7	12
Point only	1	–	1
Point and unifacial edge	1	–	1

Table 3-14. Cont'd.

Type Wear	Hudnut Component	Kartar Component	Total
Grouped Edge Angle			
1-30 Degrees	3	4	7
31-60 Degrees	30	21	51
> 60 Degrees	4	5	9
Tabular Knife			
Kind of Wear			
Abrasion/Grinding	–	1	1
Smoothing	71	109	180
Feathered chipping	–	2	2
Hinged chipping	–	1	1
Location of Wear			
Edge only	71	109	180
Unifacial edge	–	3	3
Bifacial edge	–	1	1
Grouped Edge Angle			
1-30 Degrees	12	16	28
31-60 Degrees	57	85	142
> 60 Degrees	2	12	14
Burin			
Kind of Wear			
Feathered chipping	2	3	5
Location of Wear			
Unifacial Edge	2	2	4
Point Only	–	1	1
Grouped Edge Angle			
1-30 Degrees	–	3	3
31-60 Degrees	1	–	1
> 60 Degrees	1	–	1
Graver			
Kind of Wear			
Smoothing	1	1	2
Feathered chipping	9	2	11
Hinged chipping	17	17	34
Hinged chipping/ smoothing	–	3	3
Location of Wear			
Edge only	1	1	2
Unifacial edge	11	12	23
Bifacial edge	–	2	2
Point and two edges	15	8	23
Grouped Edge Angle			
1-30 Degrees	4	9	13
31-60 Degrees	20	11	31
> 60 Degrees	1	1	2
Indeterminate	2	2	4
Drill			
Kind of Wear			
Feathered chipping	2	1	3
Feathered chipping/ smoothing	1	–	1
Hinged chipping	1	10	11
Location of Wear			
Unifacial edge	2	7	9
Point and two edges	2	4	6
Grouped Edge Angle			
1-30 Degrees	3	6	9
31-60 Degrees	1	5	6

Table 3-14. Cont'd.

Type Wear	Hudnut Component	Kartar Component	Total
Projectile Point			
Kind of Wear			
Abrasion/Grinding	2	–	2
Smoothing	5	5	10
Feathered chipping	6	10	16
Hinged chipping	6	13	19
Hinged chipping/ abrasion	–	1	1
Location of Wear			
Edge only	5	5	10
Unifacial edge	9	20	29
Bifacial edge	3	4	7
Point and two edges	2	–	2
Grouped Edge Angle			
1-30 Degrees	8	3	11
31-60 Degrees	9	25	34
> 60 Degrees	2	1	3
Chopper			
Kind of Wear			
Abrasion/Grinding	–	3	3
Smoothing	–	3	3
Crushing/Pecking	17	186	203
Feathered chipping	–	2	2
Hinged chipping	1	13	14
Hinged chipping/ smoothing	1	–	1
Hinged chipping/ crushing	1	10	11
Location of Wear			
Edge only	–	4	4
Unifacial edge	7	116	123
Bifacial edge	9	55	64
Point and bifacial edge	–	1	1
Surface	–	3	3
Terminal surface	4	38	42
Grouped Edge Angle			
31-60 Degrees	–	7	7
> 60 Degrees	16	169	185
Surface	4	41	45
Hammerstone			
Kind of Wear			
Crushing/Pecking	57	91	148
Hinged chipping/ crushing	1	–	1
Location of Wear			
Edge only	–	1	1
Unifacial edge	1	9	10
Bifacial edge	–	1	1
Surface	1	1	2
Terminal surface	56	79	135
Grouped Edge Angle			
> 60 Degrees	1	10	11
Surface	57	81	138
Edge-Ground Cobble			
Kind of Wear			
Crushing/Pecking	1	–	1
Location of Wear			
Terminal surface	1	–	1
Grouped Edge Angle			
Surface	1	–	1

Table 3-14. Cont'd.

Type Wear	Hudnut Component	Kartar Component	Total
Pestle			
Kind of Wear			
Crushing/Pecking	1	2	3
Hinged chipping/ crushing	1	–	1
Location of Wear			
Terminal Surface	2	2	4
Grouped Edge Angle			
Surface	2	2	4
Millingstone			
Kind of Wear			
Crushing/Pecking	2	20	22
Location of Wear			
Surface	2	20	22
Grouped Edge Angle			
Surface	2	20	22
Anvil			
Kind of Wear			
Crushing/Pecking	–	4	4
Location of Wear			
Surface	–	4	4
Grouped Edge Angle			
Surface	–	4	4
Hopper Mortar Base			
Kind of Wear			
Crushing/Pecking	–	4	4
Location of Wear			
Surface	–	4	4
Grouped Edge Angle			
Surface	–	4	4
Peripherally Flaked Cobble			
Kind of Wear			
Crushing/Pecking			
Location of Wear			
Surface	–	1	1
Grouped Edge Angle			
Surface	–	1	1
Amorphously Flaked Cobble			
Kind of Wear			
Crushing/Pecking	2	1	3
Hinged chipping/ crushing	–	1	1
Location of Wear			
Unifacial edge	2	–	2
Bifacial edge	–	1	1
Terminal surface	–	1	1
Grouped Edge Angle			
> 60 Degrees	2	1	3
Surface	–	1	1
Netsinker			
Kind of Wear			
Crushing/Pecking	–	2	2
Location of Wear			
Bifacial edge	–	2	2
Grouped Edge Angle			
> 60 Degrees	–	2	2

Table 3-14. Cont'd.

Type Wear	Hudnut Component	Kartar Component	Total
Shaped/Incised Slate			
Kind of Wear			
Crushing/Pecking	1	–	1
Hinged chipping	2	–	2
Location of Wear			
Unifacial edge	2	–	2
Terminal surface	1	–	1
Grouped Edge Angle			
> 60 Degrees	2	–	2
Surface	1	–	1
Indeterminate			
Kind of Wear			
Abrasion/Grinding	1	–	1
Smoothing	1	–	1
Crushing/Pecking	1	20	21
Hinged chipping/pecking	3	12	15
Location of Wear			
Edge only	1	–	1
Unifacial edge	1	22	22
Bifacial edge	4	6	10
Point and two edges	–	1	1
Terminal surface	–	3	3
Grouped Edge Angle			
31-60 Degrees	1	1	2
> 60 Degrees	5	28	33
Surface	–	3	3

exhibit predominantly smoothing wear on edges, which indicates light cutting-scraping use on soft pliable materials, rather than the feathered and hinged chipping wear we would expect if they were indeed knives. Predictably, evidence for more varied uses occurs on unifacially retouched, bifacially retouched, and utilized flakes. All three forms show smoothing or abrasion, feathered chipping, hinged chipping, and combinations thereof, indicating a range of uses on soft and hard materials. Further, unifacially retouched and utilized flakes show these kinds of wear on points as well as edges, representing a continuum of tool uses that emerges in more traditionally defined tool types. These artifacts represent tools with little or no manufacture that were utilized for a variety of jobs. In the case of retouched flakes, our interpretation of kinds of wear is, of course, hampered by our inability to distinguish between attrition due to manufacture and attrition due to use. That some limited inferences are warranted is indicated, however, by the presence of a similar range of wear types on both utilized only and retouched tools.

Tables 3-15 and 3-16 summarize functional tool types, irrespective of object type, in order to describe more clearly the distribution of tools by cultural component. KIND OF WEAR and SHAPE OF WEAR are considered in Table 3-15. KIND OF WEAR and LOCATION OF WEAR are tabulated in Table 3-16. Other dimensions are not used because they are object-specific or were seen to offer little discrimination among use categories. For example, ORIENTATION OF WEAR,

Table 3-15. Tool types: kind of wear by shape of worn area, 45-OK-11.

Wear Type	Karter Component	Hudnut Component	Total
Feathered Chipping			
Convex	78	58	136
Concave	47	48	95
Straight	172	156	328
Point	3	8	11
Feathered Chipping/Smoothing			
Convex	5	3	8
Straight	–	3	3
Point	–	1	1
Feathered Chipping/Crushing			
Concave	–	2	2
Feathered Chipping/Abrasion			
Convex	1	–	1
Hinged chipping			
Convex	87	64	151
Concave	62	62	124
Straight	134	149	283
Point	12	16	28
Notch	–	2	2
Hinged Chipping/Smoothing			
Convex	14	12	26
Concave	2	1	3
Straight	5	2	7
Point	1	–	1
Hinged Chipping/Crushing			
Convex	15	5	20
Concave	2	–	2
Straight	11	1	12
Hinged Chipping/Abrasion			
Convex	3	1	4
Straight	1	–	1
Smoothing			
Convex	45	36	81
Concave	9	3	12
Straight	68	47	115
Crushing/Pecking			
Convex	256	74	330
Concave	23	2	25
Straight	52	7	59
Abrasion-Grinding			
Convex	5	2	7
Concave	1	–	1
Straight	2	1	3
Total	1,116	766	1,887

Table 3-16. Tool types: kind of wear by location of wear, 45-OK-11.

Wear Type	Kartar Component	Hudnut Component	Total
Feathered Chipping			
Unifacial edge	273	243	516
Bifacial edge	25	22	47
Point	3	2	5
Point and edge	-	6	6
Feathered Chipping-Smoothing			
Unifacial edge	4	5	9
Bifacial edge	1	1	2
Point	-	-	-
Point and edge	-	1	1
Feathered Chipping-Crushing			
Unifacial edge	-	2	2
Feathered Chipping-Abrasion			
Unifacial edge	1	-	1
Hinged chipping			
Unifacial edge	249	258	507
Bifacial edge	34	19	53
Point	1	2	3
Point and edge	12	14	26
Hinged Chipping-Smoothing			
Unifacial edge	17	14	31
Bifacial edge	4	1	5
Point and edge	1	-	1
Hinged Chipping-Crushing			
Unifacial edge	18	1	19
Bifacial edge	10	3	13
Terminal surface	-	2	2
Hinged Chipping-Abrasion			
Unifacial edge	4	1	5
Smoothing			
Edge only	122	86	208
Crushing-Pecking			
Edge only	2	-	2
Unifacial edge	121	9	130
Bifacial edge	52	9	61
Point	1	-	1
Point and edge	1	-	1
Surface	33	3	36
Terminal surface	123	62	185
Abrasion-Grinding			
Unifacial edge	7	-	7
Bifacial edge	1	3	4
Total	1,120	769	1,894

while of undeniable potential importance, invariably classified wear areas as perpendicular to the working surface of the artifact. This is of little help, and since bias in the classification of wear direction (10X hand-lens examination) cannot be assessed, it has been excluded. Attributes describing the shape of worn areas have been collapsed into four categories: convex, concave, straight, and point. Wear classified as "irregular" has been deleted. Attributes describing locations of wear also have been collapsed to form five categories: edge only, unifacial edge, bifacial edge, point only, and surface. Attributes describing kinds of wear are identical to those presented in previous tables, and include all attributes coded on the tools in this collection.

Aspects of patterns observed in functional object types (Table 3-14) are, of course, confirmed in distributions of tool types presented in Tables 3-15 and 3-16. Feathered chipping wear and hinged chipping wear are relatively evenly distributed between cultural components, although the Hudnut component has a slightly higher percentage of both. The proportion of smoothing wear and abrasion-grinding wear is almost identical in both components. The greatest difference is in the proportion of crushing-pecking wear (30% of the wear patterns classified in the Kartar component and only 11% in the Hudnut component).

Wear located on points or points and edges is rare and is comprised predominantly of hinged chipping and feathered chipping. The prevalence of hinged chipping, often in conjunction with crushing, indicates use on hard, elastic materials, like bone, shell, or wood and tends to be found on gravers, burins, and drills.

Wear on straight-concave-convex edges is consistently feathered and hinged chipping, with much lower frequencies of smoothing, crushing, or abrasion-grinding. Feathered chipping, occasionally with smoothing, indicates light cutting or scraping functions, or use on soft materials. High frequencies of these tools (using tool to indicate the worn area itself) suggest intensive butchering activities involving meat and hide working, and correlate with high counts of resharpened flakes, bifacially and unifacially retouched flakes, and utilized flakes. Hinged chipping on edges, in conjunction with smoothing, crushing and abrasion, indicate heavier cutting and scraping uses on hard, though still elastic materials, again most probably part of butchering activities. This tool type is found primarily on scrapers, bifaces, bifacially retouched flakes, unifacially retouched flakes, and, to a lesser extent, utilized flakes. Many instances of hinged chipping on edges occur in conjunction with retouching and resharpening (35%) suggesting concern with an appropriate tool form; in this instance, with the creation and maintenance of durable unifacial or bifacial edge of a particular angle.

Wear on unifacial edges is mostly feathered chipping (43%) and hinged chipping (46%), but also includes crushing-pecking (10%), and abrasion grinding (0.5%) (Table 3-16). This pattern is quite different from that observed for bifacial edges, which consists of hinged chipping (38%), crushing-pecking (33%), feathered chipping (26%), and abrasion-grinding (2%). Also very different are the wear types on the edge only, primarily smoothing

(99%), with some crushing-pecking (1%). Wear on surfaces is almost totally crushing-pecking.

Yet another avenue for determining tool use and relationship to form is the compilation of edge angle measurements for selected artifact types and wear types. Figure 3-5 shows histograms describing edge angle distributions by wear-manufacture and wear only attributes (UTILIZATION-MODIFICATION) by cultural component, Figure 3-6 shows edge angle distributions by selected functional types, and Figure 3-7 shows edge angle distributions by selected wear types. Table 3-17 list frequencies by five-degree intervals for KIND OF WEAR by LOCATION OF WEAR and shows edge angle distribution of these attributes by component.

As shown, edge angles of worn and manufactured objects has a markedly bimodal distribution, with higher frequencies in the range 20-60 degrees and 75-100 degrees (Figure 3-5a). Edge angles for objects with wear only have a skewed distribution, centered in the range 10-40 degrees (Figure 3-5b). When surveyed by cultural component, these patterns change somewhat, marking differences in the use of certain tool types. Wear-only distributions closely parallel those presented for the combined assemblage (Figure 3-5d,f). Wear-manufacture, however, shows a bimodal distribution in the Kartar component, with peaks in the range 20-60 degrees and 75-100 degrees, and a Poisson distribution in the Hudnut component, centered in the range 20-60 degrees (Figure 3-5c,e). The bimodal distribution for the Kartar component is a reflection of the larger number of cobble tools in that assemblage. If we ignore these, we see that both components have an edge angle distribution centered in the range 20-60 degrees.

Figure 3-6 contrasts edge angle distributions for utilized flakes and modified flakes, conchoidal flakes and tabular flakes, and flake tools and formed tools. As shown, edge angle distributions clearly define the different tool categories. Utilized flakes show a distribution skewed toward the range 11-31 degrees, while other modified flakes fall into a more regular distribution centered in the range 21-51 degrees. Conchoidal flakes show a skewed distribution very like that depicted for utilized flakes, with increases in frequency in the range 31-71 degrees. Tabular flakes show a normal distribution, centered in the range 26-51 degrees. Flake tools, as a whole, show the skewed distribution noted for utilized flakes and conchoidal flakes. Formed tools, on the other hand, show a normal distribution, centered in range 21-61 degrees, very like those presented for modified flakes and tabular flakes.

Simple utilized conchoidal flakes fall in a distribution skewed toward an acute edge angle range, and indicative of their use for those tasks requiring a sharp, although fragile, edge. Retouched and resharpened conchoidal flakes, tabular knives, and formed tools all have more regular distributions occupying a broad, less acute edge angle range, and reflecting a greater concern with tool maintenance and tough, durable working edges.

Edge angle distributions by type and location of wear are shown in Table 3-17. Finer distinctions in tool form clearly distinguish elements in edge angle distributions grouped under wear-manufacture and wear only categories, selected functional object types, and selected wear types. Smoothing wear,

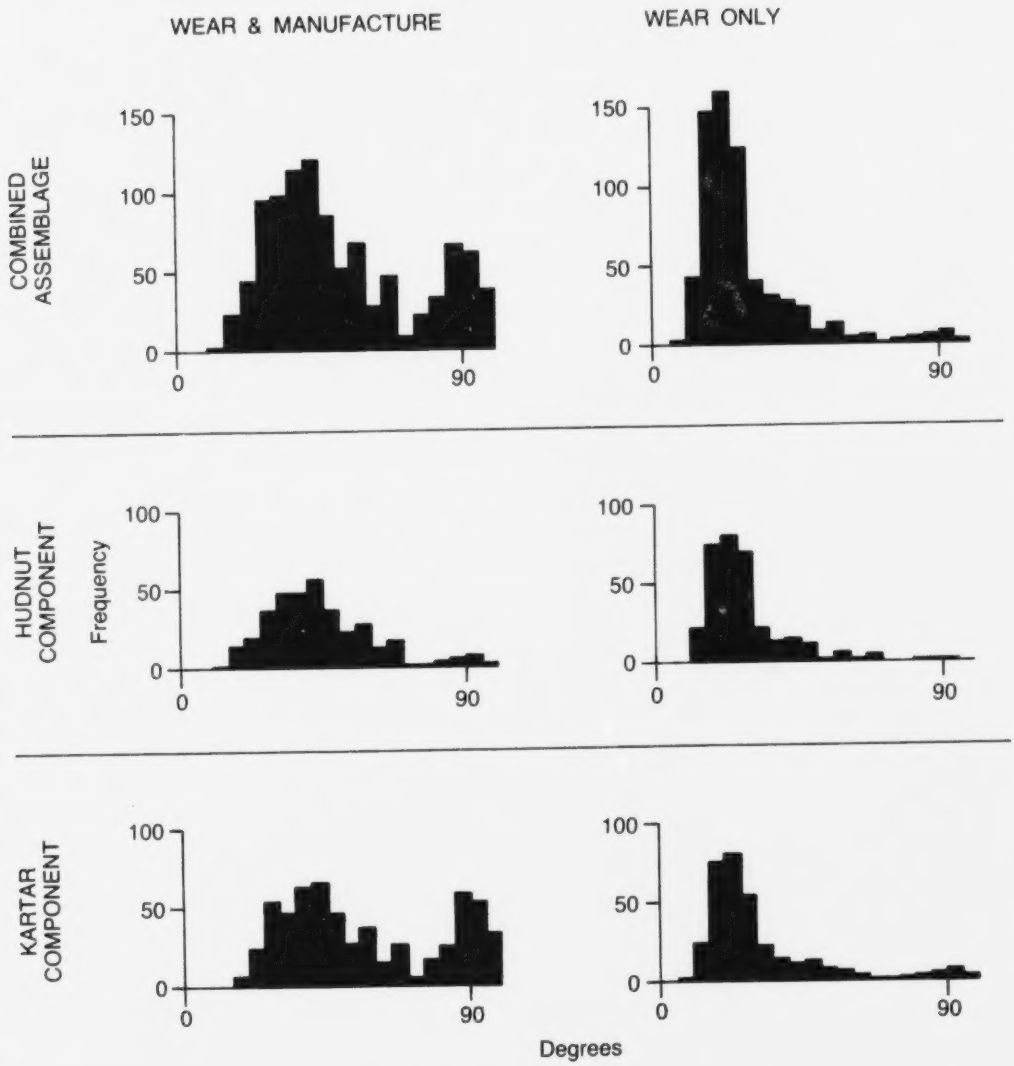

Figure 3-5. Edge angle distribution for objects with wear only and with wear and manufacture, 45-OK-11.

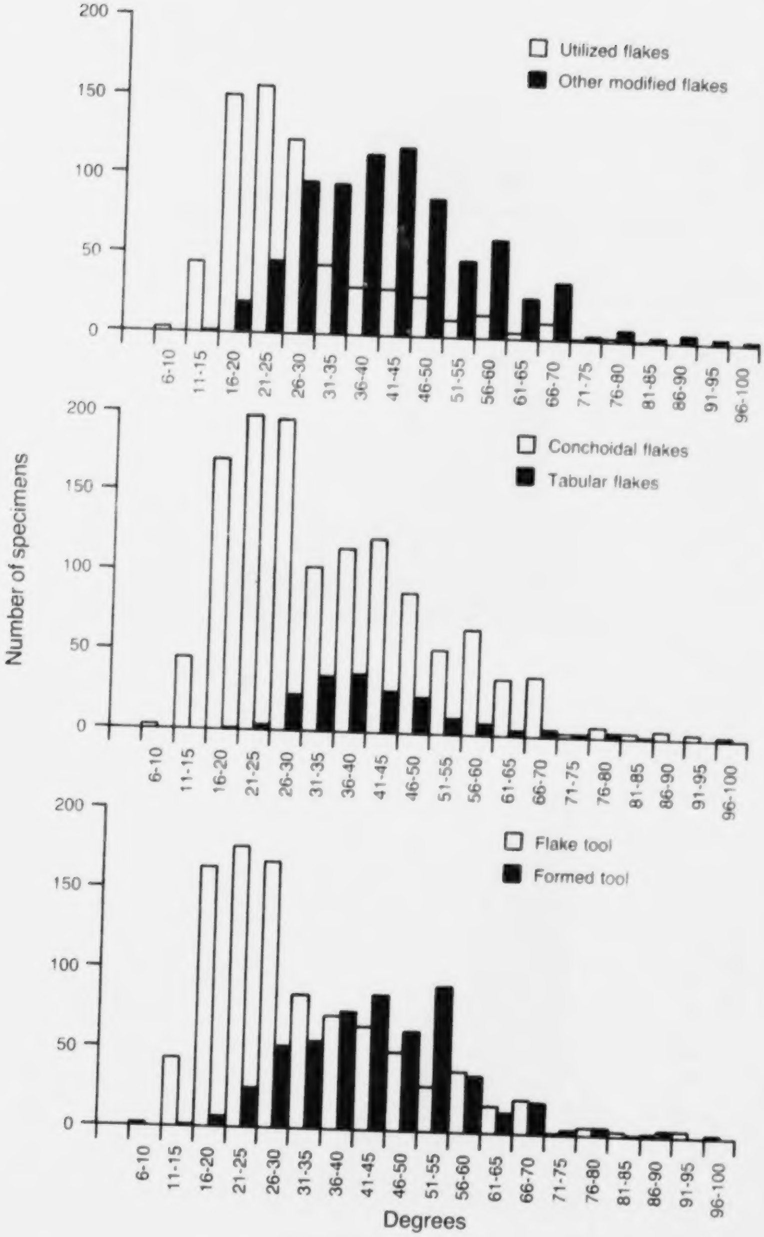

Figure 3-6. Edge angle distribution for selected functional types, 45-OK-11.

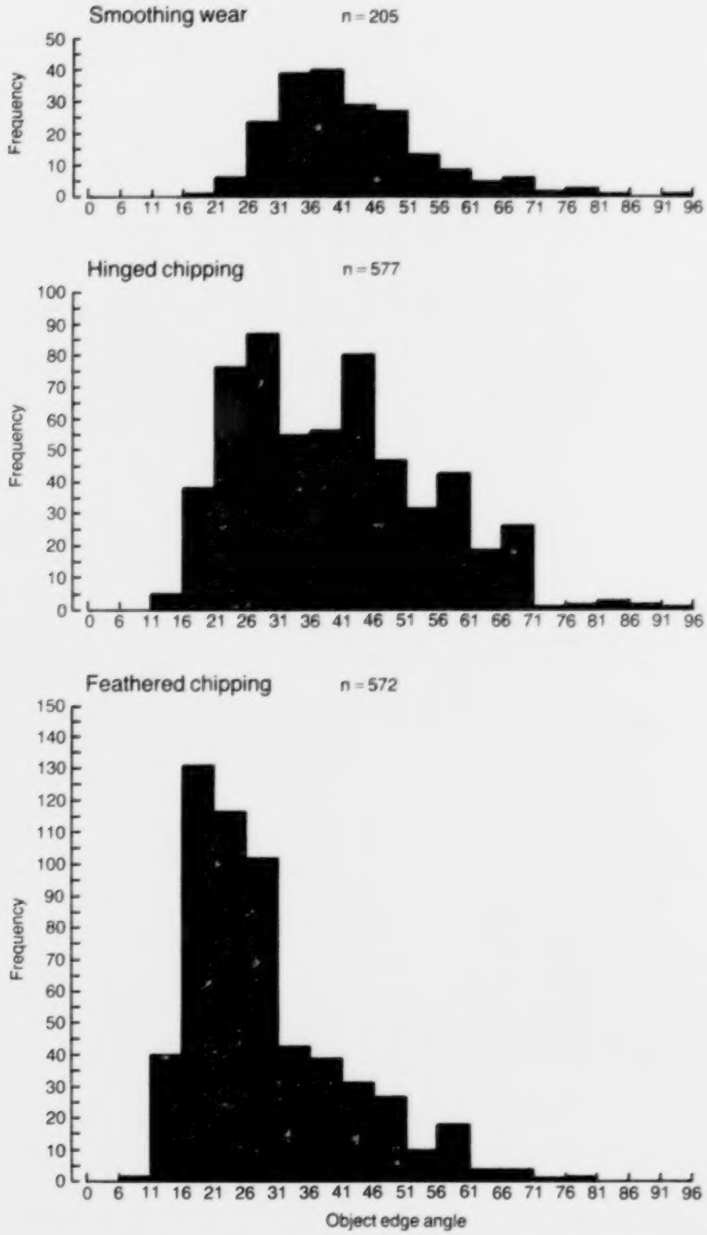

Figure 3-7. Edge angle distribution for selected wear types. 45-OK-11.

Table 3-17. Edge angle distribution of tool types defined by kind of wear and location of wear, 45-OK-11.

Kind of Wear	Location of Wear	Component	Object Edge Angle																						Total
			1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95	GT 95	SU RF	NA	
Abrasion/Grinding	Unifacial edge	A	-	-	-	-	-	-	-	1	-	2	-	1	-	1	-	1	-	1	-	-	-	-	7
	Bifacial edge	A[1]	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
		B[2]	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	3
		Total	-	-	-	-	-	-	-	-	-	1	1	1	-	1	-	-	-	-	-	-	-	-	4
Smoothing	Edge only	A	-	-	-	1	2	15	21	24	19	16	7	4	3	4	2	3	1	-	-	-	-	-	122
		B	-	-	-	-	4	9	18	16	10	11	7	5	2	3	-	-	-	-	1	-	-	-	86
		Total	-	-	-	1	6	24	39	40	29	27	14	9	5	7	2	3	1	-	1	-	-	-	208
Crushing/Pecking	Edge only	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2
	Unifacial edge	A	-	-	-	-	-	-	-	-	-	-	-	2	2	1	-	6	13	32	38	27	-	-	121
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	3	1	-	-	9
		Total	-	-	-	-	-	-	-	-	-	-	-	2	2	1	-	6	15	35	41	28	-	-	130
	Bifacial edge	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	6	7	17	14	6	-	-	52
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-	3	2	-	-	-	9
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	8	7	20	16	6	-	-	61
	Point and bifacial edge	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
	Point and two edges	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
	Surface	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	-	-	33
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	-	-	36
	Terminal surface	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	123	-	-	123
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62	-	-	62
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	185	-	-	185
Feathered Chipping	Unifacial edge	A	-	2	20	60	49	49	21	19	12	13	8	14	2	1	1	2	-	-	-	-	-	-	273
		B	-	-	17	66	49	44	15	14	15	10	2	5	2	3	-	-	1	-	-	-	-	-	243
		Total	-	2	37	126	98	93	36	33	27	23	10	19	4	4	1	2	1	-	-	-	-	-	516
	Bifacial edge	A	-	-	2	2	4	6	3	4	1	3	-	-	-	-	-	-	-	-	-	-	-	-	25
		B	-	-	1	3	8	2	3	1	3	-	1	-	-	-	-	-	-	-	-	-	-	-	22
		Total	-	-	3	5	12	8	6	5	4	3	1	-	-	-	-	-	-	-	-	-	-	-	47
	Point only	A	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
		B	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
	Point and unifacial edge	A	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Point and two edges	B	-	-	-	-	2	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	6
Feathered Chipping/ Abrasion	Unifacial edge	A	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1

[1] Karter
[2] Hudnut

Table 3-17. Cont'd.

Kind of Wear	Location of Wear	Component	Object Edge Angle																						Total
			1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	56 50	51 55	56 60	61 65	66 70	71 75	76 80	81 85	86 90	91 95	GT 95	SU RF	NA	
Feather Chipping/ Smoothing	Unifacial edge	A[1]	-	-	-	-	-	-	-	1	-	-	-	1	2	-	-	-	-	-	-	-	-	-	4
		B[2]	-	-	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
		Total	-	-	-	1	3	-	-	2	-	-	-	1	2	-	-	-	-	-	-	-	-	-	9
	Bifacial edge	A	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
		B	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
		Total	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2
	Point and two edges	B	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
	Unifacial Edge	B	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	2
Hinged Chipping/ Crushing	Unifacial Edge	A	-	-	1	19	39	32	20	23	31	21	16	20	10	10	2	1	3	-	1	-	-	-	249
		B	-	-	4	19	30	47	30	26	32	15	13	18	9	11	-	-	2	1	1	-	-	-	258
		Total	-	-	5	38	69	79	50	49	63	36	29	38	19	21	2	1	5	1	2	-	-	-	507
Hinged Chipping	Bifacial Edge	A	-	-	-	-	1	5	1	2	8	2	2	2	1	5	-	1	3	1	-	-	-	-	34
		B	-	-	-	-	2	1	1	1	4	4	-	3	-	2	-	-	-	-	1	-	-	-	19
		Total	-	-	-	-	3	6	2	3	12	6	2	5	1	7	-	1	3	1	1	-	-	-	53
	Point and Unifacial Edge	A	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
		B	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
	Point and Two Edges	A	-	-	-	-	3	-	1	1	1	3	-	-	-	-	1	-	-	-	-	-	-	2	12
		B	-	-	-	-	1	-	2	1	3	2	-	1	1	-	-	-	-	1	-	-	-	2	14
		Total	-	-	-	-	4	-	3	2	4	5	-	1	1	-	1	-	-	1	-	-	-	4	26
Hinged Chipping/ Abrasion	Unifacial edge	A	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
		B	-	-	-	-	-	-	-	-	-	1	1	-	-	2	-	-	-	-	-	-	-	-	4
		Total	-	-	-	-	-	-	-	-	-	1	1	1	-	2	-	-	-	-	-	-	-	-	5
Hinged Chipping/ Smoothing	Unifacial Edge	A	-	-	-	-	1	3	2	3	2	-	2	-	-	2	-	1	-	1	-	-	-	-	17
		B	-	-	-	-	-	2	-	2	4	4	-	1	-	-	-	-	-	-	1	-	-	-	14
		Total	-	-	-	-	1	5	2	5	6	4	2	1	-	2	-	1	-	1	1	-	-	-	31
	Bifacial Edge	A	-	-	-	-	-	-	-	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	4
		B	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
		Total	-	-	-	-	-	-	-	1	2	1	-	1	-	-	-	-	-	-	-	-	-	-	5
	Point and Two Edges	A	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Hinged Chipping/ Crushing	Unifacial Edge	A	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	7	6	2	-	-	18
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	7	6	2	-	-	19
	Bifacial Edge	A	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	6	1	-	-	-	10
		B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	3
		Total	-	-	-	-	-	-	-	-	1	-	-	-	-	2	1	-	-	6	1	2	-	-	13
	Terminal Surface	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2

[1] Karter
[2] Hudnut

occurring on edges only, shows a slightly skewed distribution, with a peak in the range 26-55 degrees (Figure 3-7). Feathered chipping wear on unifacial edges shows a distribution skewed toward more acute edge angles in the range 16-30 degrees. Feathered chipping on bifacial edges and points shows a more normal distribution, which slightly overlaps the peak range noted for unifacial edges. The combined curve for feathered chipping (Figure 3-7) is unimodal, with a peak between 16 and 31 degrees. Hinged chipping wear shows a distribution centered in a less acute edge angle range and involving a greater variety of wear types and wear locations. Hinged chipping, occurring on unifacial edges, bifacial edges, and points, has a broad distribution of edge angles from 26-80 degrees (Figure 3-7), or about the same range noted for both feathered chipping and smoothing wear. Hinged chipping-smoothing displays a similar pattern. Crushing-pecking wear on unifacial edges, bifacial edges, and points, shows an edge angle distribution restricted to an oblique range from about 60-95 degrees, with a peak between 81-95 degrees. Crushing-pecking wear on surfaces, of course, falls into the non-measured category.

No differences appear in edge angle distributions by wear type between cultural components. Similar wear types exhibit similar edge angle ranges. Shifts in relative percentages of certain functional object types do occur and these are reflected in the observed number of some wear types, but they do not alter the basic similarity between the two assemblages.

Distributions of edge angle measurements by wear type document distinctions previously made between functional tool types, and tend to support inferences about the use of certain tools (Table 3-17). Feathered chipping wear on edges, predominantly utilized flakes, consistently produces a distribution skewed toward a more acute edge angle range, supporting our interpretation of this wear and the product of light cutting use on softer materials. Absence of crushing or abrasion associated with feathered chipping also supports this inference. Hinged chipping wear and hinged chipping-crushing wear on edges, primarily on retouched flakes, resharpened flakes, and various small formed tools, has a distribution centered over a more oblique edge angle range, supporting inferences that this wear is the product of heavier cutting and scraping uses on harder materials, a function requiring a more durable working edge. Smoothing wear on edges only, or in combination with feathered or hinged chipping, consistently occurs in an oblique edge angle range comparable to that plotted for hinged chipping wear and distinct from the distribution illustrated for feathered chipping wear. It occurs on a variety of functional types, but is most characteristic of tabular knives. This name is likely a misnomer, since smoothing wear on dull edges would indicate scraping or fleshing uses on soft, pliable materials, rather than deep-cutting operations where heavy attrition occurs through contact with bone and gristle. Crushing wear on edges, though relatively infrequent, falls in an even more oblique edge angle range, indicative of heavy cutting or crushing uses, an inference supported by its high correlation with choppers, bifaces, and retouched flakes. Abrasion-grinding wear also is largely confined to edges distributed in an oblique edge angle range, again suggestive of heavy, durable tools used to cut, mash, or grind raw materials, most likely in concert with a working base of stone.

Let us now consider if there are distinct spatial patterns within the Kartar component by examining the distribution of functional object types and associated wear patterns on house floors, on living surfaces, and in the general component matrix, just as we did in the preceding Technological Analysis section. Most functional object types occur in all three assemblages, and the associated wear patterns are very consistent (Table 3-18). Certain functional types, though, are lacking from housepit floors and external living surfaces: resharpening flakes, gravers, net weights and pestles. Nor did assemblages from living surfaces yield drills, anvils, or hopper-mortar bases. Projectile points are most common in the general fill. These differences in the assemblages may not indicate distinct activities taking place in each area, since other artifact types consistently exhibit tools and wear patterns indicative of functions identical or similar to the missing object types. Further, most types which are lacking from house floors and living surfaces occur in low frequencies on the site as a whole, and so this difference may be the result of limited sampling. This may account for the fact that pestles are found on exterior living surfaces and hopper-mortar bases on housepit floors; otherwise we must question the assumption that these tools are used together or at least the assumption that they were abandoned where they were used. The higher proportion of projectile point tips on house floors may indicate that meat processing went on in the house. Brauner (1976) suggests that a relatively high frequency of projectile point tips on house floors at Alpowai evidences meat preparation--assuming that the tips were brought in with slabs of meat and removed prior to cooking. This could well be the case at 45-OK-11, but it is, at best, a speculative conclusion.

In general, then, the same functional object types occur in the Kartar component fill, housefloors, and living surfaces, in about the same proportion, and with very nearly identical wear patterns. Indeed, if we disregard the functional types and simply assess wear types, we see even less difference in the three assemblages (Tables 3-19). All kinds of wear and wear locations exhibit very similar edge angle distributions, distributions very closely patterned after those discussed previously for the Kartar and Hudnut component tool assemblages. This suggests that activities in these three areas of the site were similar, entailed use of similar tool types and a uniform use of these tools. We do, however, recognize a difference in the composition of these assemblages in terms of duration of tool use and maintenance. Table 3-20 presents wear-area ratios for the defined functional types and distributions by the Kartar component fill, house floors, and external living surfaces. There is a marked tendency for some tools (blades, scrapers, bifaces, drills, and hammerstones) to have been used more intensively in structured activity areas like house floors and living surfaces. It would seem that tools used in activities in bounded areas were more intensively utilized, not as quickly discarded, and, quite possibly, more carefully maintained.

Table 3-18. Formal type and wear variables by cultural context, Kartar component[1], 45-OK-11.

Type/Wear	General Fill	House Floors	Living Surfaces	Total
Utilized Only				
Kind of Wear				
Feathered chipping	168	28	25	221
Hinge chipping	56	25	10	91
Hinged chipping/smoothing	1	–	–	1
Location of Wear				
Unifacial edge	204	49	33	286
Bifacial edge	18	4	2	24
Point only	1	–	–	1
Point and unifacial edge	2	–	–	2
Grouped Edge Angle				
1-30 degrees	170	41	21	232
31-60 degrees	51	12	12	75
>60 degrees	4	–	2	6
Total	225	53	35	313
Linear Flake				
Kind of Wear				
Feathered chipping	2	1	–	3
Hinged chipping	–	4	–	4
Location of Wear				
Unifacial edge	2	5	–	7
Grouped Edge Angle				
1-30 degrees	2	4	–	6
31-60 degrees	–	1	–	1
Total	2	5	0	7
Unifacially Retouched Flake				
Kind of Wear				
Crushing/pecking	–	1	–	1
Feathered chipping	24	6	2	32
Feathered chipping/Smoothing	1	–	–	1
Hinged chipping	62	6	8	76
Hinged chipping/abrasion	1	–	–	1
Hinged chipping/smoothing	6	–	–	6
Hinged chipping/crushing	–	2	–	2
Location of Wear				
Unifacial edge	86	14	10	110
Bifacial edge	8	1	–	9
Group Edge Angle				
1-30 degrees	32	5	1	38
31-60 degrees	55	6	8	69
>60 degrees	7	4	1	12
Total	94	15	10	119
Bifacially Retouched Flake				
Kind of Wear				
Abrasion/grinding	2	–	–	2
Feathered chipping	7	2	–	9
Hinged chipping	18	6	4	28
Hinged chipping/smoothing	2	–	–	2
Location of Wear				
Unifacial edge	25	6	2	33
Bifacial edge	4	2	2	8
Grouped Edge Angle				
1-30 degrees	5	1	–	6
31-60 degrees	20	4	1	25
>60 degrees	4	3	3	10
Total	29	8	4	41
Resharpening Flake				
Kind of Wear				
Feathered Chipping	2	–	–	2
Hinged Chipping	5	–	–	5

Table 3-18. Cont'd.

Type/Wear	General Fill	House Floors	Living Surfaces	Total
Location of Wear				
Unifacial edge	6	–	–	6
Bifacial edge	1	–	–	1
Grouped Edge Angle				
1-30 degrees	2	–	–	2
31-60 degrees	5	–	–	5
Total	7	0	C	7
Scraper				
Kind of Wear				
Abrasion/grinding	1	–	1	2
Smoothing	3	–	–	3
Feathered chipping	15	2	–	17
Feathered chipping/abrasion	1	–	–	1
Feathered chipping/smoothing	2	–	–	2
Hinged chipping	26	3	2	31
Hinged chipping/abrasion	2	–	–	2
Hinged chipping/smoothing	5	1	1	7
Location of Wear				
Edge only	3	–	–	3
Unifacial edge	46	5	3	54
Bifacial edge	5	1	1	7
Point and two edges	1	–	–	1
Grouped Edge Angle				
1-30 degrees	4	2	–	6
31-60 degrees	40	3	3	46
>60 degrees	11	1	1	13
Total	55	6	4	65
Chopper				
Kind of Wear				
Abrasion/grinding	3	–	–	3
Smoothing	3	–	–	3
Crushing/pecking	151	27	9	187
Feathered chipping	2	–	–	2
Hinged chipping	10	2	1	13
Hinged chipping/crushing	10	–	–	10
Location of Wear				
Edge only	4	–	–	4
Unifacial edge	93	20	4	117
Bifacial edge	49	4	2	55
Point and bifacial edge	1	–	–	1
Surface	3	–	–	3
Terminal surface	29	5	4	38
Grouped Edge Angle				
31-60 degrees	7	–	–	7
>60 degrees	140	24	6	170
Surface	32	5	4	41
Total	179	29	10	218
Biface				
Kind of Wear				
Smoothing	–	1	2	3
Feathered chipping	2	1	–	3
Feathered chipping/smoothing	2	–	–	2
Hinged chipped	12	6	–	18
Hinged chipping/smoothing	2	–	1	3
Hinged Chipping/crushing	1	–	2	3
Location of Wear				
Edge only	–	1	2	3
Unifacial edge	15	6	1	22
Bifacial edge	4	1	2	7

Table 3-18. Cont'd.

Type/Wear	General Fill	House Floors	Living Surfaces	Total
Grouped Edge Angle				
1-30 degrees	3	1	–	4
31-60 degrees	14	6	3	23
>60 degrees	2	1	2	5
Total	19	8	5	32
Tabular Knife				
Kind of Wear				
Abrasion/grinding	1	–	–	1
Smoothing	75	8	26	109
Feathered chipping	2	–	–	2
Hinged chipping	1	–	–	1
Location of Wear				
Edge only	75	8	26	109
Unifacial edge	3	–	–	3
Bifacial edge	1	–	–	1
Grouped Edge Angle				
1-30 degrees	15	–	1	16
31-60 degrees	55	8	22	85
>60 degrees	9	–	3	12
Total	79	8	26	113
Burin				
Kind of Wear				
Feathered chipping	3	–	–	3
Location of Wear				
Unifacial edge	2	–	–	2
Point only	1	–	–	1
Grouped Edge Angle				
1-30 degrees	3	–	–	3
Total	3	0	0	3
Graver				
Kind of Wear				
Smoothing	1	–	–	1
Feathered chipping	2	–	–	2
Hinged chipping	17	–	–	17
Hinged chipping/smoothing	3	–	–	3
Location of Wear				
Edge only	1	–	–	1
Unifacial edge	12	–	–	12
Bifacial edge	2	–	–	2
Point and two edges	8	–	–	8
Grouped Edge Angle				
1-30 degrees	9	–	–	9
31-60 degrees	11	–	–	11
>60 degrees	1	–	–	1
Intermediate	2	–	–	2
Total	23	0	0	23
Drill				
Kind of Wear				
Feathered Chipping	1	–	–	1
Hinged Chipping	4	6	–	10
Location of Wear				
Unifacial Edge	3	4	–	7
Point and Two Edge	2	2	–	4
Grouped Edge Angle				
1-30 degrees	2	4	–	6
31-60 degrees	3	2	–	5
Total	5	6	0	11

Table 3-18. Cont'd.

Type/Wear	General Fill	House Floors	Living Surfaces	Total
Projectile Point				
Kind of Wear				
Smoothing	3	2	-	5
Feathered chipping	10	-	-	10
Hinged chipping	13	-	1	14
Hinged chipping/abrasion	1	-	-	1
Location of Wear				
Edge only	3	2	-	5
Unifacial edge	20	-	-	20
Bifacial edge	4	-	-	4
Point and two edges	-	-	1	1
Grouped Edge Angle				
1-30 degrees	3	-	-	3
31-60 degrees	23	2	1	26
>60 degrees	1	-	-	1
Total	27	2	1	30
Amorphously Flaked Cobble				
Kind of Wear				
Crushing/pecking	-	-	1	1
Hinged chipping/crushing	1	-	-	1
Location of Wear				
Bifacial edge	1	-	-	1
Terminal surface	-	-	1	1
Grouped Edge Angle				
>60 degrees	1	-	-	1
Surface	-	-	1	1
Total	1	0	1	2
Peripherally Flaked Cobble				
Kind of Wear				
Crushing/pecking	1	-	-	1
Location of Wear				
Surface	1	-	-	1
Grouped edge angle				
Surface	1	-	-	1
Total	1	0	0	1
Netsinker				
Kind of Wear				
Crushing/pecking	2	-	-	2
Location of Wear				
Bifacial edge	2	-	-	2
Grouped Edge Angle				
>60 degrees	2	-	-	2
Total	2	0	0	2
Pestle				
Kind of Wear				
Crushing-Pecking	2	-	-	2
Location of Wear				
Terminal Surface	2	-	-	2
Grouped Edge Angle				
Surface	2	-	-	2
Total	2	0	0	2

Table 3-18. Cont'd.

Type/Wear	General Fill	House Floors	Living Surfaces	Total
Hammerstone				
Kind of Wear				
Crushing/pecking	63	22	11	96
Location of Wear				
Edge only	-	-	1	1
Unifacial edge	6	3	-	9
Bifacial edge	-	1	-	1
Surface	-	1	-	1
Terminal surface	57	17	10	84
Grouped Edge Angle				
>60 degrees	6	4	-	10
Surface	57	18	11	86
Total	63	22	11	96
Anvil				
Kind of Wear				
Crushing/pecking	2	2	-	4
Location of Wear				
Surface	2	2	-	4
Grounded Edge Angle				
Surface	2	2	-	4
Total	2	2	0	4
Hopper Mortar Base				
Kind of Wear				
Crushing/pecking	2	2	-	4
Location of Wear				
Surface	2	2	-	4
Grouped Edge Angle				
Surface	2	2	-	4
Total	2	2	0	4
Millingstone				
Kind of Wear				
Crushing/pecking	11	7	2	20
Location of Wear				
Surface	11	7	2	20
Grounded Edge Angle				
Surface	11	7	2	20
Total	11	7	2	20
Indeterminate				
Kind of Wear				
Crushing/pecking	19	2	-	21
Hinged chipping/crushing	12	-	-	12
Location of Wear				
Unifacial edge	20	2	-	22
Bifacial edge	7	-	-	7
Point and two edges	1	-	-	1
Terminal surface	3	-	-	3
Grouped Edge Angle				
31-60 degrees	-	1	-	1
>60 degrees	28	1	-	29
Surface	3	-	-	3
Total	31	2	0	33

[1] Non-lithic Materials Deleted.

Table 3-19. Edge angle distribution of tool types defined by kind of wear and location of wear[1], by cultural context, Kartar component, 45-OK-11.

Kind of Wear	Location of Wear	Cultural[1] Context	Object Edge Angle																						Total
			1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 80	81 85	86 90	91 95	GT 95	SURF	NA	
Abrasion/Grinding	Unifacial Edge	A	-	-	-	-	-	-	-	1	-	2	-	1	-	1	-	-	-	1	-	-	-	-	6
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
		Total	-	-	-	-	-	-	-	1	-	2	-	1	-	1	-	1	-	1	-	-	-	-	7
	Bifacial Edge	A	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Smoothing	Edge Only	A	-	-	-	1	2	14	10	16	14	10	6	2	2	2	2	3	1	-	-	-	-	-	85
		HF	-	-	-	-	-	-	4	1	2	2	1	1	-	-	-	-	-	-	-	-	-	-	11
		LS	-	-	-	-	-	1	9	7	3	4	-	1	1	2	-	-	-	-	-	-	-	-	28
		Total	-	-	-	1	2	15	23	24	19	16	7	4	3	4	2	3	1	-	-	-	-	-	124
Crushing/Pecking	Edge Only	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2
	Unifacial Edge	A	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	5	11	26	28	19	-	-	92
		HF	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	5	9	8	-	-	25
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	4
		Total	-	-	-	-	-	-	-	-	-	-	-	2	2	1	-	6	13	32	38	27	-	-	121
	Bifacial Edge	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	7	7	15	13	4	-	-	48
		HF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-	-	4
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	7	7	17	14	6	-	-	53
	Point and Bifacial Edge	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
	Point and Two Edges	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
	Surface	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	-	19
		HF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	12
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33	-	33
	Terminal Surface	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91	-	91
		HF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	22
		LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	15
		Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128	-	128
Feathered Chipping	Unifacial Edge	A	-	2	18	50	39	37	15	16	10	11	5	11	1	-	1	1	-	-	-	-	-	-	217
		HF	-	-	2	7	8	7	6	1	2	-	1	-	1	1	-		-	-	-	-	-	-	36
		LS	-	-	-	5	3	7	-	2	-	2	2	3	-	-	-	-	-	-	-	-	-	-	25
		Total	-	2	20	62	50	51	21	19	12	13	8	14	2	1	1	2	-	-	-	-	-	-	278
	Bifacial Edge	A	-	-	2	1	3	6	2	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-	20
		HF	-	-	-	1	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4
		LS	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	-	-	2	2	4	6	3	4	2	3	-	-	-	-	-	-	-	-	-	-	-	-	26
	Point Only	A	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Point and Unifacial Edge	A	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Feathered Chipping/ Abrasion	Unifacial Edge	A	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Feathered Chipping/ Smoothing	Bifacial Edge	A	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1

Table 3-19. Cont'd.

Kind of Wear	Location of Wear	Cultural Context	Object Edge Angle																						Total
			1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 80	81 85	86 90	91 95	GT 95	SURF	NA	
Hinged Chipping	Unifacial Edge	A	–	–	–	12	29	18	14	17	26	19	15	16	7	9	2	1	3	–	1	–	–	–	189
		HF	–	–	1	7	10	13	5	3	4	1	–	4	2	–	–	–	–	–	–	–	–	–	50
		LS	–	–	–	–	2	5	1	5	1	2	1	1	1	2	–	–	–	–	–	–	–	–	21
		Total	–	–	1	19	41	36	20	25	31	22	16	21	10	11	2	1	3	–	1	–	–	–	260
	Bifacial Edge	A	–	–	–	–	1	5	–	2	7	2	1	1	–	4	–	–	1	–	–	–	–	–	24
		HF	–	–	–	–	–	–	1	–	1	–	1	–	–	–	–	1	1	1	–	–	–	–	6
		LS	–	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–	1	–	–	–	–	–	4
		Total	–	–	–	–	1	5	1	2	8	2	2	2	1	5	–	1	3	1	–	–	–	–	34
	Point and Unifacial Edge	A	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1
	Point and Two Edges	A	–	–	–	–	2	–	1	1	1	2	–	–	–	–	1	–	–	–	–	–	–	2	10
		HF	–	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	2
		LS	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1
		Total	–	–	–	–	3	–	1	1	1	3	–	1	–	–	1	–	–	–	–	–	–	2	13
Hinged Chipping/ Abrasion	Unifacial Edge	A	–	–	–	–	–	–	–	–	–	1	1	–	–	2	–	–	–	–	–	–	–	–	4
Hinged Chipping/ Smoothing	Unifacial Edge	A	–	–	–	–	1	3	1	3	2	–	1	–	–	1	–	1	–	1	–	–	–	–	14
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1
		–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2
		Total	–	–	–	–	1	3	2	3	2	–	2	–	–	2	–	1	–	1	–	–	–	–	17
	Bifacial Edge	A	–	–	–	–	–	–	–	1	1	1	–	1	–	–	–	–	–	–	–	–	–	–	4
	Point and Two Edges	A	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Hinged Chipping/ Crushing	Unifacial Edge	A	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2	7	4	2	–	–	16
		HF	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	2
		Total	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2	7	6	2	–	–	18
	Bifacial Edge	A	–	–	–	–	–	–	–	–	1	–	–	–	–	2	–	–	–	4	1	–	–	–	8
		LS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	2
		Total	–	–	–	–	–	–	–	–	1	–	–	–	–	2	–	–	–	6	1	–	–	–	10

[1] Cultural Context: A=General Fill, HF-House floor, LS=Living Surface.

Table 3-20. Functional type and wear area ratio by cultural context, Kartar component[1], 45-OK-11.

Functional Type	Number of Wear Areas	General Fill		House Floors		Living Surfaces		Total Ratio
		Frequency	Ratio	Frequency	Ratio	Frequency	Ratio	
Utilized flake	1	76	225/135 =1.67	18	53/32 =1.66	13	35/23 =1.65	312/190 =1.64
	2	38		9		8		
	3	14		3		2		
	4	4		2		-		
	5	3		-		-		
Unifacially retouched flake	1	25	94/50 =1.88	3	15/8 =1.87	2	15/6 =2.5	124/64 =1.94
	2	12		1		1		
	3	8		2		2		
	4	4		-		-		
	5	1		-		1		
Bifacially retouched flake	-	18	29/33 =.879	7	4/8 -.80	4	8/10 =.50	41/51 =.804
	1	6		-		4		
	2	5		2		-		
	3	3		-		-		
	4	1		1		-		
Resharpening flake	-	6	7/13 =.539	-		3	0/3 -0.0	7/16 =.437
	1	3		-		-		
	2	2		-				
Blade	-	1	2/2 -1.00	-	5/2 -2.50	-		7/4 -1.75
	2	1						
	3	-		1				
Linear flake	-	3	0/3 -0.0	-		-		0/3 =0.0
Scraper	1	3	55/20 =2.75	-	6/2 =3.0	1	4/2 =2.0	65/24 =2.71
	2	6		1		-		
	3	5		-		1		
	4	5		1		-		
	5	1		-		-		
Biface	-	70	19/87 =.218	5	6/9 =.669	9	5/12 -.417	32/108 =.296
	1	15		2		1		
	2	2		1		2		
	4	-		1		-		
Tabular knife	-	34	79/88 =.897	4	8/9 =.889	1	26/19 -1.37	113/116 =.974
	1	31		3		11		
	2	21		1		6		
	3	2		1		1		
Burin	1	1	3/2 =1.50	-		-		3/2 =1.50
	2	1						
Graver	1	2	23/8 =2.87	-		-		23/8 =2.87
	2	2						
	3	1						
	4	2						
	6	1						
Drill	-	1	5/3 =1.67	-	6/2 =3.00	-		11/5 -2.20
	2	1		0				
	3	1		2				
Projectile point	-	84	27/102 =.265	12	2/13 =.154	10	1/11 =.091	30/126 =.238
	1	10		-		1		
	2	7		1		-		
	3	1		-		-		

Table 3-20. Cont'd.

Functional Type	Number of Wear Areas	General Fill		House Floors		Living Surfaces		Total Ratio
		Frequency	Ratio	Frequency	Ratio	Frequency	Ratio	
Chopper	-	72	179/151 =1.18	12	29/33 =.879	15	10/22 =.454	218/206 =1.06
	1	28		4		4		
	2	22		2		3		
	3	15		1		-		
	4	10		-		-		
	5	2		1		-		
	6	2		-		-		
	7	-		1		-		
Meul	-	2	0/2 =0	-		-		0/2 =0
Hammerstone	1	20	63/35 =1.80	2	22/8 =2.75	3	11/6 =1.83	96/49 =1.96
	2	8		3		2		
	3	4		-		-		
	4	1		2		1		
	5	1		-		-		
	6	1		1		-		
Edge ground cobble	-	3	0/3 =0	-		-		0/3 =0
Pestle	-	3	1/4 =.250	-		-		1/4 =.250
	1	1						
Millingstone	-	5	11/16 =.687	-	7/7 =1.00	-	2/2 =1.00	20/25 =.800
	1	11		7		2		
Anvil	1	2	2/2 =1.00	2	2/2 =1.00	-		4/4 =1.00
Hopper mortar base	1	2	2/2 =1.00	2	2/2 =1.00	-		4/4 =1.00
Peripherally flaked cobble	-	2	1/3 =.333	2	0/2 =0	-		1/5 =.200
	1	1		-				
Amorphously flaked cobble	-	8	1/9 =.111	4	0/4 =0	2	1/3 =.333	2/16 =.125
	1	1		-		1		
Netsinker	-	1	2/2 =1.00	-		-		2/2 =1.00
	2	1						
Indeterminate	-	14	31/21 =1.48	8	2/9 =.222	1	0/1 =0	33/31 =1.06
	2	2		1		-		
	4	2		-		-		
	6	2		-		-		
	7	1		-		-		

[1] Total number of worn areas/total number of objects.

CONCLUSIONS

Activity in both cultural components very likely centered on the butchering and processing of large and small game (see the Faunal Chapter for lists of associated species). Wear patterns consistently show combinations of feathered chipping, hinged chipping, and smoothing, indicative of slicing, cutting, and scraping of animal parts. Most wear in all categories occurs on unifacial edges, a practical, durable tool form with a wide range of potential uses. Feathered chipping wear and hinged chipping wear occurs in approximately equal frequencies in the tool assemblages, comprising over 66% of the total. Crushing-pecking wear, although less frequent, clearly constitutes a significant diagnostic pattern closely correlated with the high relative frequency of cobble tools in the Kartar component. This wear occurs primarily on unifacial edges and surfaces and evidences processing of hard materials, and soft materials in conjunction with a stone support base. Choppers, hammers and anvils could be used to separate bone and ligaments from the carcass for transport of meat, to extract marrow, and, perhaps, to prepare bone meal. There are several instances of clear association between cobble choppers, hammerstones, and anvils, with large, extensive butchering stations in the Kartar component (see the Feature Chapter for listing of features and associated tools). Pestles, millingstones, and hopper mortar bases were used in the processing of other materials, perhaps meat, certainly plant parts, such as hard-shelled nuts, roots, and seeds (see Botanical Chapter).

Change over time at 45-OK-11 seems more a matter of the substitution of certain tool types or classes rather than any real shift in economic focus. The very even distribution of distinctive tool types and associated wear patterns supports this. Both cultural components contained a wide variety of tool types, with distributions reflecting markedly similar economies. The most common artifacts in both tool assemblages were simple flake tools: utilized flakes, retouched flakes, resharpened flakes, and tabular flake knives. Multi-purpose forms, they exhibit all of the wear patterns characteristic of both small formed tools and large unformed tools. Some small formed tools do not occur in both assemblages (e.g., gravers are lacking in the Kartar component), but these types make up only a very small percentage of the tool assemblage, and we will not speculate on what this means in terms of prehistoric activities. The most obvious difference between the two cultural components is in the greater frequency of cobble tools and greater variety of wear patterns on cobble tools in the earlier Kartar Phase.

Other researchers have documented a similar difference between counterpart cultural phases, the Cascade Phase, ca. 8000-5000 B.P, and later Tucannon and Frenchman Springs Phases, ca. 5000-2000 B.P., in the Vantage and lower Snake River regions. The varied cobble tool industry in the former is replaced by a flake tool industry in the latter (cf., Nelson 1969; Leonhardy and Rice 1970; Bense 1972). The decreased importance of the cobble tool industry in the Hudnut phase may reflect some substantial difference in overall economy. Alternatively it may be related to more limited changes in site use. Stays of longer duration in the older component, evidenced in housepits and structured activity areas, may have resulted in the greater production of heavy cobble tools. The upper cultural component, which lacks structured cultural features, is characterized instead by smaller, lighter, portable tool forms. A shift in site use may well explain the relative absence of the less portable cobble tools, beyond simple choppers and hammerstones that required little investment in effort. This topic will be explored in greater detail in the following stylistic subsection.

In summary, functional analysis has defined several distinct patterns in the tool assemblages from 45-OK-11: (1) tool types and associated wear patterns indicate that a major economic activity in both cultural components was the hunting and attendant on-site butchering and processing of large and small game; (2) differences in tool use within defined tool types is not marked over the span of occupation; (3) the greatest functional difference between cultural components is in the variability in form and use in the cobble tool industry.

STYLISTIC ANALYSIS

This site assumes importance in Columbia Plateau prehistory because of the presence of housepits dated at 5100-4200 B.P., matching the earliest known occurrence of semi-subterranean dwellings in the Pacific Northwest (cf., Brauner 1976; Ames et al. 1981). In most culture-historical reconstructions, this period is considered a pivotal, transition marked by the end of the late Cascade Phase and beginnings of the Tucannon/Frenchman Springs Phase in adjacent regions (Nelson 1969; Leonhardy and Rice 1970). While researchers agree that the earlier and later phase assemblages are distinct, they do not agree on how the changes in material traits reflect in the economic character of the respective cultural systems. Until recently, it was argued that the occurrence of housepits was confined to the last three thousand years, and that the winter village pattern observed ethnographically was not present until perhaps 1000 B.P. (Daugherty et al. 1967; Leonhardy and Rice 1970; Nelson 1969; Swanson 1962). Brauner's work (1976) at Alpowa and that of Ames et al. (1981) at Hatwai, documenting housepits in use prior to 4000 years ago, have forced revision of past reconstructions and engendered a variety of hypotheses to account for a transition to semi-permanent settlement closely linked to changing climatic and environmental conditions (cf., Ames and Marshall 1981; Brauner 1976; Browman and Munsell 1969; Rice 1974). Prehistoric societies of the Cascade Phase commonly have been characterized as nomadic hunters and gatherers, with a non-nucleated settlement pattern; an adaptive system based on the seasonal movement of small family groups tied to the availability of seasonally recurrent resources and not in large part dependent upon any given resource (cf., Bense 1972; Rice 1974). Brauner (1976) has criticized this view; he suggests a continuity between adaptations in the Cascade Phase and later Plateau cultures. Certainly, the presence of housepits on sites dating between 5000-4000 B.P. indicates semi-permanent or recurrent settlement keyed to some dependable resource or array of resources most likely linked to use of riverine environments. Browman and Munsell (1969), Rice (1974), and Ames and Marshall (1981) also suggest that an increasing dependence upon the exploitation of root crops played a role in the development of the village pattern observed in the Tucannon or Frenchman Springs and later cultural phases.

A question of importance in the analysis of diagnostic artifacts from site 45-OK-11 is whether the cultural assemblage is Cascade-like or Tucannon-like. The distinction is more than semantic, since relatedness to one phase or the other will cast new light on prior cultural reconstructions. If Cascade-like, one can no longer postulate a dramatic shift of adaptive strategy or population replacement in the period from 5000-4000 B.P embodied in the different phase assemblages (cf., Brauner 1976). If diagnostic artifacts indicate closer affiliation to the subsequent Tucannon or Frenchman Springs Phase, one must push back the period of transition between the two distinctive cultural assemblages (cf., Ames et al. 1981). If, however, diagnostic artifacts show no clear-cut correlations with diagnostic elements indicative of both the earlier and later assemblages, we may conclude that the transition was gradual and that the nature of the human adaptive system cannot be assessed merely on the evidence of trait complexes.

It would be helpful then to review the characteristics of the different phase assemblages. Bense (1972:43) offers a practical identification of a Cascade Phase assemblage in the lower Snake River region:

> The lanceolate projectile point, side-notched projectile point, edge-ground cobble, and knives are the artifact types most characteristic of the Cascade Phase. Given a suitable sample containing these artifact types or other types which exhibit the lithic technique characteristic of the phase, the assemblage may reasonably be assigned to the Cascade Phase.

Aside from these hallmarks, the Cascade artifact assemblage is also seen to contain a varied cobble tool industry, a well-developed bone tool industry, and a Levallois-like reduction technique (Butler 1962; Leonhardy and Rice 1970; Leonhardy and Muto 1972; Muto 1976). Leonhardy and Rice (1970) further state that there appears to be, at least in the Snake River region, a marked preference for fine-grained basalt, reduced both as tabular flakes and blades.

The subsequent Tucannon Phase in the lower Snake River region is seen to lack the Cascade and Cold Springs side-notched projectile points, characteristic large lanceolate and triangular knives, the varied cobble tool industry, and the Levallois-like reduction technique. Diagnostic traits include a variety of corner-removed and corner-notched projectile points, a variable flake tool technology, mortars, hopper mortar bases, and pestles (cf., Leonhardy and Rice 1970; Browman and Munsell 1969; Nelson 1969). Elements of a fishing technology, including hooks, valves, harpoons, and netsinkers, are much more common (Nelson 1969; Browman and Munsell 1969; Rice 1974). All in all, the general conclusion is that the quality of lithic manufacturing decreases markedly, subsumed within more varied industries turning out a greater variety of fine flake tools (Leonhardy and Rice 1970; Greengo 1982), and that the artifact assemblages reflect a greater reliance on utilization of root crops and fishing (Browman and Munsell 1969; Rice 1974; Ames et al. 1981).

Here we will compare diagnostic artifact types recovered from 45-OK-11 with these traits outlined for Cascade Phase and Tucannon Phase assemblages. Figure 3-8 presents the relationship of phases defined for the Rufus Woods Lake project area and those identified on the Snake River, and shows postulated changes in the trait complexes. The Snake River cultural sequence is presented rather than that of the Middle Columbia River (Grabert 1968, 1973; Nelson 1969; Greengo 1982) since it is the more detailed and the more generally accepted. We are using previously defined cultural phases and assemblages only for the sake of comparison; we are not attempting to posit direct physical relationship between people in the northern Columbia Plateau and those further south. Our primary goal will be to establish close parallels for the housepit occupation at 45-OK-11 date at about 5000-4000 B.P., and determine whether it can be identified as Cascade-like or the later Tucannon-like, or is a blending of both. We may thus corroborate or refute the assertion made by most prior researchers that housepits are not properly associated with the Cascade-like Phase.

PROJECTILE POINTS

Two separate but conceptually related analyses are used to classify projectile points. A **morphological classification** is used to define descriptive types that do not directly correspond to recognized historical types. The classification serves as an independent check on the temporal distribution of projectile point forms in the Rufus Woods Lake project area and measures the distribution of formal attributes as well as point styles. An **historical classification** includes recognized types with discrete temporal distributions. A multivariate statistical program which compares line and angle measurements taken along the outlines of the points is used to derive metric definitions for defined types and assign our specimens to types. Together, these analyses allow us to (1) assess formal and temporal variation in our collection without first imposing prior typological constructs, (2) correlate specimens recovered from our study area with those found elsewhere on the Columbia Plateau in a consistent, verifiable manner, (3) develop a typology that incorporates both qualitative and quantitative scales of measurement, and (4) examine the temporal significance of specific formal attributes as well as aggregates viewed as ideal types.

Eleven classificatory dimensions have been defined for morphological classification: BLADE/STEM JUNCTURE, OUTLINE, STEM EDGE ORIENTATION, SIZE, BASAL EDGE SHAPE, BLADE EDGE SHAPE, CROSS SECTION, SERRATION, EDGE GRINDING, BASAL EDGE THINNING, and FLAKE SCAR PATTERN (Table 3-2). Of these, the first four (D1-D4) define 18 morphological types. The other seven serve to describe these types more fully, and permit the identification of variants within the types.

By defining the margins of projectile points, we are able to place them within one of the 18 morphological types. This is done by drawing straight lines from nodes where the outline of the specimen changes direction. Figure 3-9 illustrates the technique. For a corner-notched triangular point, the blade is defined as line segment a-A. The shoulder is line segment A-1. The

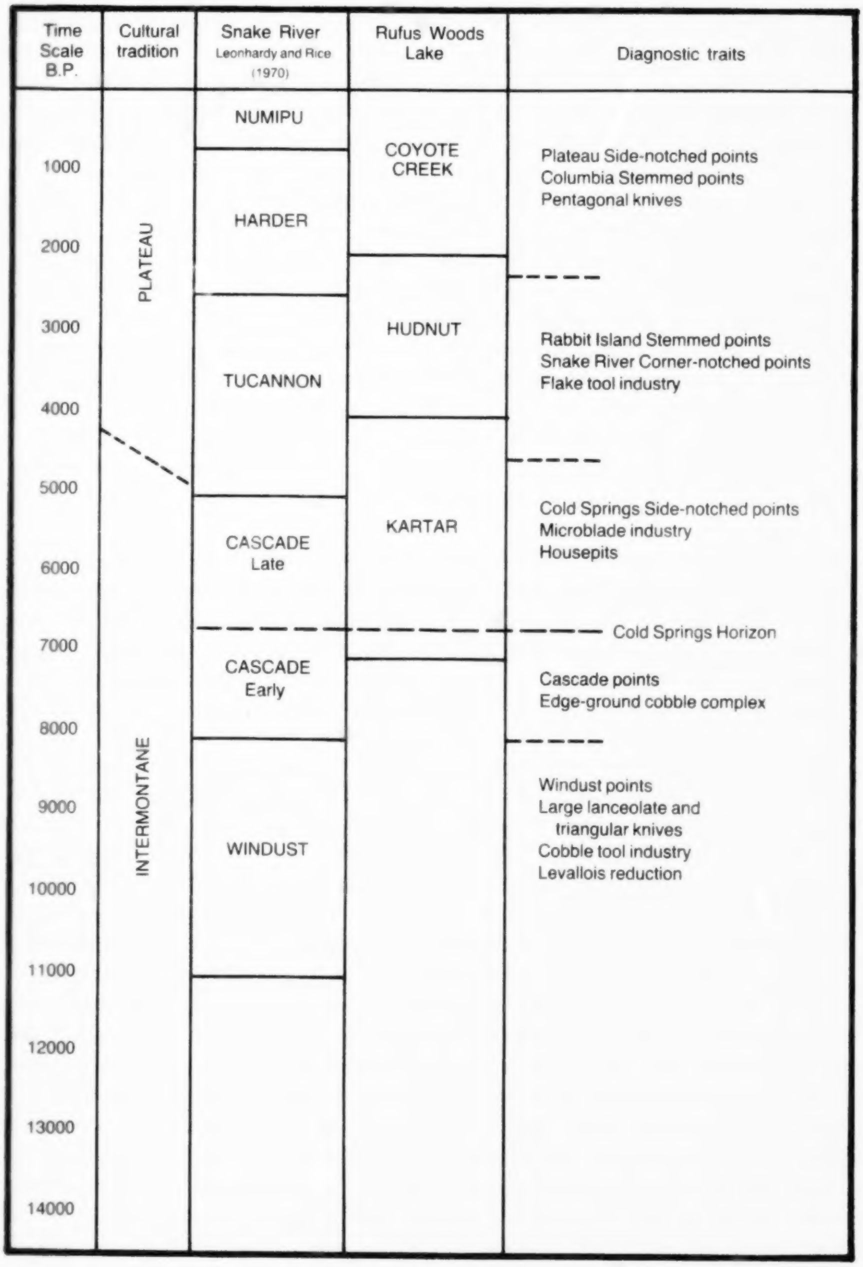
Time Scale B.P.
Cultural tradition
Snake River Leonhardy and Rice (1970)
Rufus Woods Lake
Diagnostic traits
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
PLATEAU
INTERMONTANE
NUMIPU
HARDER
TUCANNON
CASCADE Late
CASCADE Early
WINDUST
COYOTE CREEK
HUDNUT
KARTAR
Plateau Side-notched points
Columbia Stemmed points
Pentagonal knives
Rabbit Island Stemmed points
Snake River Corner-notched points
Flake tool industry
Cold Springs Side-notched points
Microblade industry
Housepits
Cold Springs Horizon
Cascade points
Edge-ground cobble complex
Windust points
Large lanceolate and triangular knives
Cobble tool industry
Levallois reduction

Figure 3-8. Culture-historical reconstruction on the Columbia Plateau.

Table 3-21. Morphological projectile point classification.

DIMENSION I: BLADE-STEM JUNCTURE

N. Not separate
1. Side-notched
2. Shouldered
3. Squared
4. Barbed
9. Indeterminate

DIMENSION II: OUTLINE

N. Not applicable
1. Triangular
2. Lanceolate
9. Indeterminate

DIMENSION III: STEM EDGE ORIENTATION

N. Not applicable
1. Straight
2. Contracting
3. Expanding
9. Indeterminate

DIMENSION IV: SIZE

N. Not applicable
1. Large
2. Small

DIMENSION V: BASAL EDGE SHAPE

N. Not applicable
1. Straight
2. Convex
3. Concave
4. Point
5. 1 or 2 and notched
9. Indeterminate

DIMENSION VI: BLADE EDGE SHAPE

N. Not applicable
1. Straight
2. Excurvate
3. Incurvate
4. Reworked
9. Indeterminate

DIMENSION VII: CROSS SECTION

N. Not applicable
1. Planoconvex
2. Biconvex
3. Diamond
4. Trapezoidal
9. Indeterminate

DIMENSION VIII: SERRATION

N. Not applicable
1. Not serrated
2. Serrated
9. Indeterminate

DIMENSION IX: EDGE GRINDING

N. Not applicable
1. Not ground
2. Blade edge
3. Stem edge
9. Indeterminate

DIMENSION X: BASAL EDGE THINNING

N. Not applicable
1. Not thinned
2. Short flake scars
3. Long flake scars
9. Indeterminate

DIMENSION XI: FLAKE SCAR PATTERN

N. Not applicable
1. Variable
2. Uniform
3. Mixed
4. Collateral
5. Transverse
6. Other
9. Indeterminate

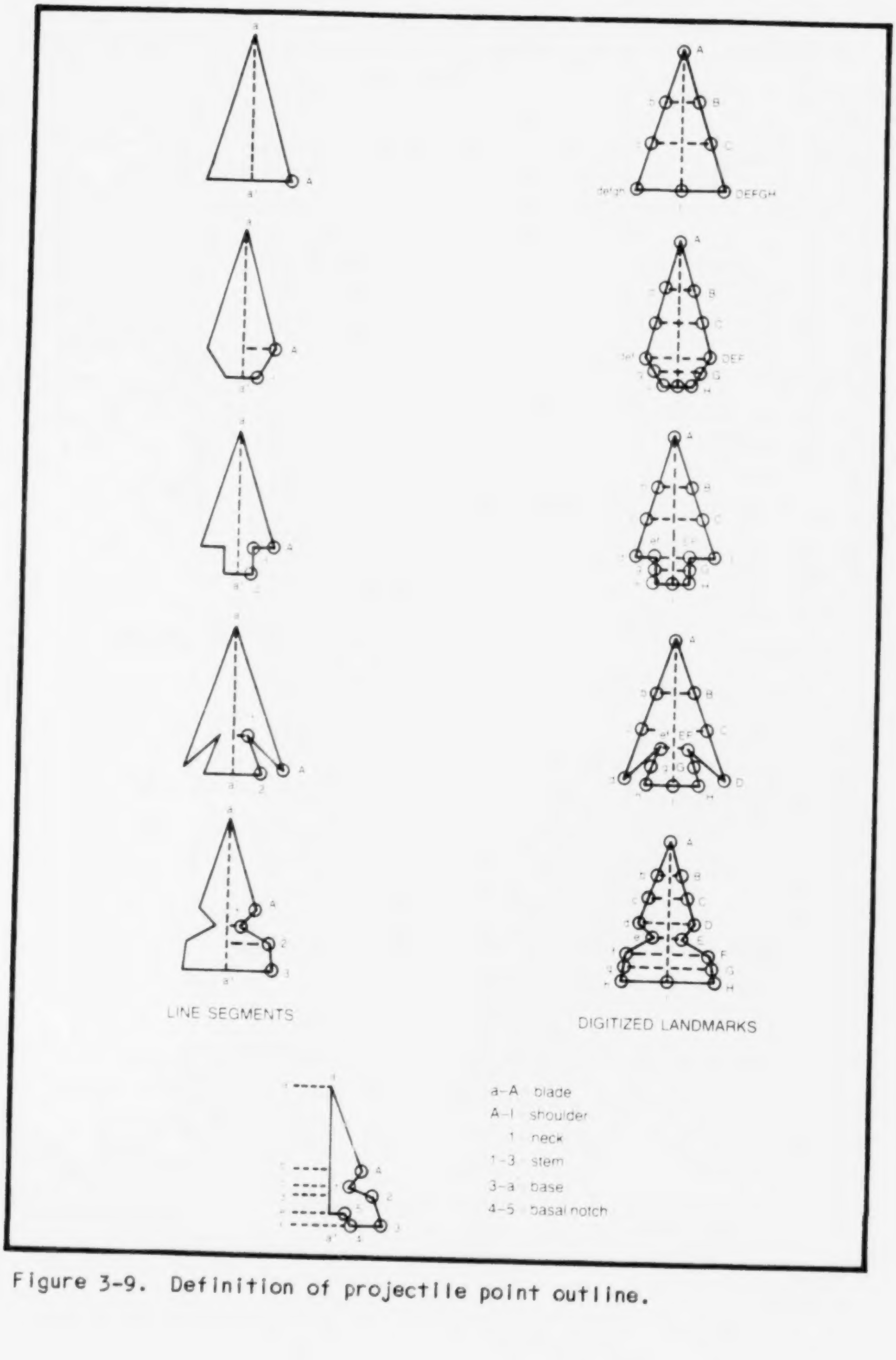
LINE SEGMENTS
DIGITIZED LANDMARKS
a–A blade
A–1 shoulder
1 neck
1–3 stem
3–a base
4–5 basal notch

Figure 3-9. Definition of projectile point outline.

neck is node 1. The stem is line segment 1-2. The base is line segment 2-a'. Terms applied and the number of line segments vary with the two basic subdivisions of form. Lanceolates generally are defined by four or fewer line segments (aA12). Stemmed triangular forms are defined by five or fewer line segments (aA123). Side-notched triangular forms are defined by five or more line segments (aA12345). Table 3-22 lists the 18 morphological types with descriptions, classification codes, and line segment definitions.

Cross-tabulation of classificatory dimensions D5-D11 supplies detailed descriptions of the 18 morphological types and allows us to assess the temporal distribution of formal attributes as well as that of point styles. We might subdivide any or all of the types in terms of their basal edge shape, serration, or flaking pattern. We can also assess the chronological significance of concave bases, serrated margins, or regular collateral flaking pattern independent of associated morphological type. Further, we can use this information to establish variants in the basic historical types.

We have defined historical types on the basis of line and angle measurements in order to have a consistent classification method which utilizes published illustrations of projectile points. Other measurements such as weight and thickness were taken on projectile points in our collection, but problems of cost and efficiency precluded handling of specimens from other study areas. These measurements can be included in analyses of our points, for definition of types and type variants that will correlate with acknowledged types, but they are not part of the initial typological exercise. This decision is based on prior research emphasizing the outline of projectile points as the basis of classification (Benfer 1967; Ahler 1970; Gunn and Prewitt 1975; Holmer 1978).

Our desire for a statistically derived classification prompted selection of a multivariate statistical method termed discriminant analysis (Nie et al. 1975). In this analysis, individual specimens are sorted into selected groups on the basis of mathematical equations derived from analysis of cases with known memberships. First, we assembled representative specimens for each acknowledged historical type, and tested group autonomy through analysis of specified discriminating variables. Then we used derived equations called discriminant functions to assign specimens in our collection to the statistically defined projectile point types. All cases are given a probability of group membership, calculated as the distance a given case score is away from a group score. Discriminating variables--those providing the most separation between groups--are ranked and serve as type definitions. The outcome is a statistically defensible projectile point typology based on traditional, intuitively derived classifications. The resulting classification has mathematically defined ranges of variability, enabling the researcher to quickly and consistently categorize a large collection. It offers a sound, rational basis for definition of new types as well as an explicit definition of accepted types. We can thereby correlate the Rufus Woods Lake projectile point sequence with other chronologies in both a quantitative and qualitative manner. For a detailed discussion of procedures and assumptions involved in discriminant analysis see Johnson (1978) and Klecka (1980).

Table 3-22. Morphological classification of projectile points: morphological type, description, classification code and line segment definition.

Type	Description	Classification	Definition
1	Large Triangular	N 1 N 1	aA
2	Small Triangular	N 1 N 2	aA
3	Large Side-notched	1 N N 1	aA123, aA1234, aA12345
4	Small Side-notched	1 N N 2	aA123, aA1234, aA12345
5	Lanceolate	N 2 N N	aA
6	Shouldered Lanceolate	2 2 N N	aA, aA1, aA12
7	Large, Shouldered Triangular, contracting stem	2 1 2 1	aA, aA1
8	Small, Shouldered Triangular, contracting stem	2 1 2 2	aA, aA1
9	Large, Shouldered Triangular, non-contracting stem	2 1 (13) 1	aA12, aA123
10	Small, Shouldered Triangular, non-contracting stem	2 1 (13) 2	aA12, aA123
11	Large, Squared Triangular, contracting stem	3 1 2 1	aA1
12	Small, Squared Triangular, contracting stem	3 1 2 2	aA1
13	Large, Squared Triangular, non-contracting stem	3 1 (13) 1	aA12, aA123
14	Small, Squared Triangular, non-contracting stem	3 1 (13) 2	aA12, aA123
15	Large, Barbed Triangular, contracting stem	4 1 2 1	aA1
16	Small, Barbed Triangular, contracting stem	4 1 2 2	aA1
17	Large, Barbed Triangular, non-contracting stem	4 1 (13) 1	aA12, aA123
18	Small, Barbed Triangular, non-contracting stem	4 1 (13) 2	aA12, aA123

We assembled a type collection for the Columbia Plateau of over 1,200 specimens that constituted originally defined type examples, labelled specimens of recognized types, or type variants that were reasonably well-dated. By critically reviewing the archaeological literature, we identified 23 historical types which we arranged in six formal type series (Figure 3-10). We consistently applied distinctions based on the original type definitions, modified, where appropriate, by subsequent research. We routinely defined type variants, usually suggested by prior researchers, which segregate specimens according to diagnostic patterns in morphology. Historical types identified here represent a synthesis of projectile point types and cultural reconstructions postulated by researchers in different areas of the Columbia Plateau, and were not taken from any single typology or chronological sequence (e.g., Butler 1961, 1962; Nelson 1969; Leonhardy and Rice 1970). Names are usually those applied by the first researcher to define a specific type. We developed variant labels by using the accepted type name followed by a letter denoting diagnostic variation. For a complete discussion of our procedures see Lohse (1984g).

The distribution of morphological types by component is given in Table 3-23. Large side-notched, lanceolate, and shouldered lanceolate points are predominantly associated with the Kartar component. Triangular points with corner-notches and basal-notches are largely confined to the Hudnut component. This distribution corresponds quite well to what we could expect to find given prior typologies on the Columbia Plateau: lanceolate and shouldered lanceolate forms in the period dating 5100-4200 B.P. and varied triangular forms in the period from 4200-2800 B.P.

Table 3-23. Frequency of morphological and historical types, 45-OK-11.

Component		Morphological Type												Total
		3	5	6	7	8	9	10	11	12	13	14	17	
Hudnut	N	-	12	8	10	17	1	1	2	5	1	2	-	59
	Col %		20.3	13.6	16.9	28.6	1.7	1.7	3.4	8.5	1.7	3.4		
Kartar	N	2	27	30	5	-	1	-	-	-	2	-	1	68
	Col %	2.9	39.7	44.1	7.4		1.5				2.9		1.5	
Total	N	2	39	38	15	17	2	1	2	5	3	2	1	127

Table 3-24 shows the relationship between morphological types and recognized historical types. As shown, morphological classes correspond closely to defined historical types. Lanceolate points correspond to Windust, Cascade, and shouldered lanceolate categories. Shouldered lanceolates points include Mahkin Shouldered, and some Cascade and early Rabbit Island varieties. The two large side-notched forms are examples of Cold Springs Side-notched. Shouldered triangular points with contracting stems represent primarily Rabbit Island varieties. Shouldered and barbed triangular points with straight and expanding stems are classified as Columbia Corner-notched, Quilomene Bar Corner-notched, and Wallula Rectangular Stemmed varieties.

HISTORICAL TYPE CLASSIFICATION

DIVISION	LANCEOLATE		TRIANGULAR			
SERIES	SIMPLE	SHOULDERED	SIDE-NOTCHED	CORNER-REMOVED	CORNER-NOTCHED	BASAL-NOTCHED
TYPE	11 LARGE LANCEOLATE 15 WINDUST C Contracting base 21 CASCADE A 22 CASCADE B 23 CASCADE C	12 LIND COULEE 13 WINDUST A 14 WINDUST B 31 MAHKIN SHOULDERED	41 COLD SPRINGS 42 PLATEAU Side-notched	51 NESPELEM BAR 52 RABBIT ISLAND A 53 RABBIT ISLAND B	61 COLUMBIA A Corner-notched 62 QUILOMENE Corner-notched 63 COLUMBIA B Corner-notched 64 WALLULA Rectangular stemmed	71 QUILOMENE A Basal-notched 72 QUILOMENE B Basal-notched 73 COLUMBIA STEM A [illegible]LUMBIA STEM B 75 COLUMBIA STEM C

Types are numbered consecutively within formal series: a two-digit code indicates the approximate temporal sequence of defined series and types.

Type names are those most commonly applied. Mahkin Shouldered and Nespelem Bar are types defined for the Rufus Woods Lake project area.

Figure 3-10. Historical projectile point types.

Table 3-24. Cross-tabulation of morphological and historical types, 45-OK-11.

Morphological Type	Historical Type[1]													Total
	15	21	22	23	31	41	51	52	53	61	62	63	64	
3	-	-	-	-	-	2	-	-	-	-	-	-	-	2
5	1	26	1	8	3	-	-	-	-	-	-	-	-	39
6	-	5	-	1	32	-	1	-	-	-	-	-	-	39
7	-	-	-	-	1	-	10	4	1	-	-	1	-	17
8	-	-	-	-	-	-	9	6	5	-	-	-	-	20
9	-	-	-	-	-	-	-	-	-	2	-	-	-	2
10	-	-	-	-	-	-	-	-	-	1	-	-	-	1
11	-	-	-	-	-	-	1	-	-	1	-	-	-	2
12	-	-	-	-	-	-	-	2	1	-	-	1	2	6
13	-	-	-	-	-	-	-	-	-	2	1	-	-	3
14	-	-	-	-	-	-	-	-	-	1	-	1	-	2
17	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Total	1	31	1	9	36	2	21	12	7	7	1	3	3	134

[1] See Figure 3-10 for key to type names.

Historic projectile point types are briefly discussed below, included are possible correlates with types illustrated by other authors and metric measurements of selected attributes. Table 3-25 gives measurements.

TYPE 15. Windust D. N=1 (Figure 3-L;m)

A small, short lanceolate form with a slightly flaring, concave basal margin, this point does not correspond to a defined historic type but, because of its relative proportions, it has been placed in a Windust variety. Although not a classic Windust type, it has its closest correlate in specimens attributed to late Windust-early Cascade periods (H. Rice 1972; Leonhardy 1970; D. Rice 1965). A related type is Cascade B (Type 22).

TYPE 21. Cascade A. N=31

These points are broad, elongate Cascade types with variable flaking and cross section. Ten specimens have a marked diamond-shaped cross section and possible arris or striking platform remnant indicative of being made on blades. Twenty specimens have either a mixed uniform-collateral, collateral, or transverse flaking pattern. None are serrated. These are solid examples of defined Cascade forms, and correspond to type specimens illustrated by Butler (1962), H. Rice (1965), D. Rice (1969, 1972), Leonhardy (1970) and Leonhardy and Rice (1970).

Table 3-25. Selected measurements of projectile points by historic type, 45-OK-11.

Historic Type[1]		Blade Length (mm)	Blade Width (mm)	Haft Length (mm)	Neck Width (mm)	Blade Length/ Total Length (mm)	Neck Width/ Basal Width (mm)
15	N	1	1	1	1	1	1
	x	180	67	130	67	.085	.679
21	N	27	33	33	33	27	33
	x	273.1	92.4	185.7	92.5	.603	.227
	s.d.	72.0	17.3	47	17.3	.063	.226
22	N	1	1	1	1	1	1
	x	136	67.5	212	67.5	.391	.459
23	N	8	9	9	9	8	9
	x	288.8	67	159	66.5	.672	.261
	s.d.	71.4	11.5	72.2	11.8	.1025	.264
31	N	33	39	39	39	33	39
	x	314	85.1	132.6	62.7	.706	.692
	s.d.	85.5	21.8	40.1	16.9	.076	.251
41	N	2	2	2	2	2	2
	x	268.2	88.2	102.2	62	.732	1.196
	s.d.	155.2	2.47	7.42	4.94	.089	.169
51	N	21	23	23	23	21	23
	x	228.3	71.4	76.6	53.3	.756	.521
	s.d.	53.3	13.1	25.7	13.5	.068	.207
52	N	10	12	12	12	10	12
	x	212.6	64.7	54.6	36.8	785	.505
	s.d.	84.7	9.92	20	7.9	.079	.178
53	N	7	7	7	7	7	7
	x	197.4	65.1	63.2	35.3	.757	.270
	s.d.	25.6	16.4	9.5	12.2	.029	.321
61	N	7	7	7	7	7	7
	x	238.3	84.1	91	54.3	.719	.997
	s.d.	58.7	15.1	14.3	9.8	.040	.141
62	N	1	1	1	1	1	1
	x	398	135.5	111	80.5	.782	.870
63	N	3	3	3	3	3	3
	x	189.7	68.8	66	36.3	.739	.979
	s.d.	27	7.5	4.8	2.02	.043	.072
64	N	3	3	3	3	3	3
	x	252.8	76.2	58	37.3	.821	.767
	s.d.	112.7	27.4	26.8	6.8	.023	.080

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[1] See Figure 3-10 for key to type name.

TYPE 22. Cascade B. N=1

The single specimen is a roughly flaked lanceolate form with a notched base. Made on a thin, twisted flake, it has been only partially reduced on both the dorsal and ventral surfaces. This specimen is not a particularly good example of this Cascade variant, but has closest parallels in forms assigned to the earlier Cascade subphase (ca. 8000-7000 B.P.), and illustrated by Rice (1972), and Leonhardy (1970).

TYPE 23. Cascade C. N=9

Elongate, often delicate lanceolate forms, with regular, symmetrical outlines, these specimens correspond to the classic Cascade Type first defined by Butler (1962). Five specimens have the diagnostic diamond-shaped cross section and probable arris remnants characteristic of having been made on blades. Two examples are serrated. These very closely resemble illustrations assembled by Butler (1962), H. Rice (1965), D. Rice (1969, 1972), Leonhardy (1970), and Leonhardy and Rice (1970).

TYPE 31. Mahkin Shouldered Lanceolate. N=36

This is the most common class recovered at 45-OK-11, and consists of large to small, short, slightly shouldered lanceolate forms with variable outlines and flaking patterns. Most appear to have been made on thick flakes, although five examples probably were made on blades. This is not a well-defined type elsewhere on the Plateau, although comparable specimens have been found scattered throughout late Cascade and Tucannon or Frenchman Springs assemblages (Rice 1969, 1972; Leonhardy 1970; Nelson 1969; Greengo 1982; Grabert 1968). Their presence in any quantity seems to be more characteristic of assemblages on the upper Columbia River, with frequency increasing as one moves northward (cf., Nelson 1969; Chance and Chance 1982; Sanger 1970b). Lack of a previous type definition has prompted us to name these specimens Mahkin Shouldered and to develop a definition based on the large number recovered from sites in our project area. It appears that these represent an early form transitional to the defined Rabbit Island series, and may be the likely ancestors of the smaller, shouldered triangular points that become common in the late Frenchman Springs or Hudnut Phases.

TYPE 41. Cold Springs Side-notched. N=2

Two specimens are identified as Cold Springs Side-notched, large side-notched forms with a lanceolate outline and variable cross section. These indicate a late Cascade subphase affiliation, sometime after the 7000 B.P. date given to the Mt. Mazama eruption, and characteristic of the so-called "Cold Springs Horizon" (Butler 1962, 1965). This type, as presently defined, is a large, variable class of related forms.

illustrated examples (H. Rice 1965, 1972; Nelson 1969; D. Rice 1969, 1972; Leonhardy 1970; Butler 1962; Leonhardy and Rice 1970) include a variety of forms with triangular to lanceolate outlines, collateral to variable flaking, and well-defined side notches and squared basal margins to slight lateral indentations and rounded basal margins. On the Columbia Plateau, this type is seen to date in the period 7000-5000 B.P., yet in the northern Great Basin and Idaho, a similar form, the Bitterroot Side-notched is documented to date from prior to 7000 B.P. up to at least 2000 B.P. (cf., Butler 1962, 1978; Swanson 1962). One specimen (M#1795) appears to be a good representative of illustrated Cold Springs Side-notched specimens. The other (M#424) is more similar to some Bitterroot Side-notched examples, and thus, falls more closely in line with the period 5100-4200 B.P. established for the Kartar component at 45-OK-11. Infrequent in our project area and in excavations along the middle and upper Columbia, it is impossible to assess accurately the temporal duration of these forms, beyond stating that they are considered characteristic of the late Cascade subphase.

TYPE 51. Nespelem Bar. N=21

Like the Mahkin Shouldered Lanceolate discussed above, this is a type newly defined on the basis of the assemblages from project sites (Lohse 1984g). Isolated examples are fairly common on the Columbia Plateau, but have usually been classified as variants of the Rabbit Island Stemmed Type (e.g., Swanson 1962; Nelson 1969; Greengo 1982). The points are sufficiently distinct and frequent in the project area to justify defining a separate type. These specimens are thick, squat triangular forms with slight to well-defined sloping shoulders, and contracting, rounded stems. One example appears to have been made on a blade. Five are irregularly serrated. Sixteen specimens have markedly variable irregular flaking patterns. Comparable specimens are illustrated by Rice (1969, 1972), Nelson (1969), Greengo (1982), and Chance and Chance (1982).

TYPE 52. Rabbit Island A. N=12

Recovered specimens are large, thick triangular forms with squared shoulders and contracting stems. Two are serrated. All have variable flaking patterns. This type is characteristic of the Frenchman Springs Phase defined by Swanson (1962) and Nelson (1969). Infrequent in collections on the lower Columbia River, where they are occasionally found in Tucannon Phase assemblages with Columbia corner-notched forms, this type is considered characteristic of the period from about 4000-2000 B.P. Comparable specimens are illustrated by Swanson (1962), Nelson (1969), Rice (1969, 1972), and Greengo (1982).

TYPE 53. Rabbit Island B. N=7

All specimens are small, often delicate, triangular forms with markedly contracting stems. Five are serrated. Two show a fine mixed uniform-collateral flaking pattern. This variant of the Rabbit Island Stemmed Type appears characteristic of the latter part of the Frenchman Springs Phase, dating from about 3000-2000 B.P. (Nelson 1969). Nelson (1969), Swanson (1962), and Greengo (1982) show comparable specimens.

TYPE 61. Columbia Corner-notched A. N=7

Specimens assigned to this type show variable haft treatment, with straight to expanding stems, on large, slightly barbed triangular forms. They have a generally crude appearance, with slightly irregular outlines, and variable flaking patterns. Best defined by Leonhardy and Rice (1970), this type is seen to mark the Tucannon Phase (ca. 5000-2500), although similar forms continue to appear well into the later Harder Phase (ca. 2500-800 B.P.). Comparable specimens are presented in Rice (1969, 1972), Nelson (1969), Leonhardy (1970), and Greengo (1982).

TYPE 62. Quilomene Bar Corner-notched. N=1

The single example is a large triangular form with slightly barbed shoulders and straight to slightly expanding stem. Flaking is variable, and the lateral margins of the blade exhibit deep notches about midway down the sides. Defined by Nelson (1969), this type is part of a larger Quilomene Bar series which includes various basal-notched varieties, and is thought to date sometime after 2500 B.P., with similar forms occurring well into the late Cayuse Phase (ca. 2000-0 B.P.). Comparable specimens are illustrated by Nelson (1969) and Greengo (1982).

TYPE 63. Columbia Corner-notched B. N=3

Small triangular points with slightly barbed shoulders and generally expanding stems, these specimens are smaller variants of Columbia Corner-notched A. Leonhardy and Rice (1970) illustrate similar examples as characteristic of the Tucannon and Harder Phases. Comparable specimens are also illustrated by Nelson (1969), Leonhardy (1970), and Greengo (1982).

TYPE 64. Wallula Rectangular-stemmed. N=3

Two of the three examples classified here are good examples of the type as defined by Shiner (1961), with small, narrow triangular blades, straight to slightly barbed shoulders, and essentially straight, elongate stems. The other specimen (M#2000) is an aberrant form; a large triangular point with a slightly excurvate blade margin, downward projecting barbs and a delicate straight stem. Classified as Wallula Rectangular-stemmed primarily because of the slight bars and straight-sided stem, this specimen is probably better referred to as an aberrant example of a Columbia Corner-notched A, or, perhaps, a previously unrecognized type. Certainly, its associated radiocarbon date of 4757±157 B.P., (B-4288) precludes assignment within the Wallula Rectangular-stemmed type as now defined. The two other specimens are comparable to forms illustrated by Shiner (1961), Nelson (1969), and Greengo (1982), and dated to the Cayuse Phase (ca. 2000-0 B.P.). Shiner (1961) and Nelson (1969) suggest that this type is related to the Columbia Stemmed series, and may in fact, represent a form transitional between that type and the earlier Columbia Corner-notched or Quilomene Bar Corner-notched varieties. This suggestion is particularly interesting given the aberrant specimen typed as a Wallula Rectangular-stemmed and dated to the Kartar Phase at 45-OK-11, although we cannot in any way postulate an actual historic connection.

The distribution of historical types closely parallels that observed for morphological types, with a fairly good separation of lanceolate and side-notched types in the Kartar component and triangular corner-notched and basal-notched types in the Hudnut component (Table 3-26). There is some overlap in the two major components, particularly in the Cascade A and C categories, where 28% of the specimens were recovered from the upper zone. If we refer back to Appendix B, Table B-1, we see that all but two of these specimens were recovered from Zone 53 in the lower fill of upper Housepit 1. This indicates that at least one occupation properly attributable to the Kartar Phase was included in the upper Hudnut Phase zone assemblage.

Table 3-27 further clarifies the stratigraphic distribution of projectile point types by illustrating the type distribution within the Housepit 1 excavation block. It clearly shows that Zones 53 and 61 are transitional between the two separate component or phase assemblages, with both lanceolate and triangular point types. Further, a check on the actual unit level proveniences of these point types reveals that the Cascade and shouldered lanceolate varieties underlie the Rabbit Island, Columbia Corner-notched and Quilomene Bar Corner-notched varieties in the fill of upper Housepit 1. The distribution presented in Table 3-28 for the Housepit 4 excavation block reveals an even clearer stratigraphic separation of point types. In this excavation area, there is a very clear separation of Windust, Cascade, shouldered lanceolate, and large side-notched types in the lower Kartar component from Rabbit Island and Columbia Corner-notched types in the upper Hudnut component. The overlap of diagnostic types in the Housepit 1 excavation block simply shows that the definition of analytic zones in that area did not differentiate between earlier and later occupations, not surprising given the jumble of cultural materials in the fill of the large pit feature, and the lack of structured features. A differential distribution of point types between components is clearly represented, and, perhaps more interestingly, a fairly tight zone of transition between the two separate

Table 3-26. Historical projectile point type distribution within two major components, 45-OK-11.

Component		Historical Type[1]													Total
		15	21	22	23	31	41	51	52	53	61	62	63	64	
Hudnut	N Col %	-	8 14.5	-	3 5.5	7 12.7	-	12 21.8	10 18.2	6 10.9	4 7.3	1 1.8	2 3.6	2 3.6	55
Kartar	N Col %	1 1.4	22 31.4	1 1.4	6 8.6	29 41.4	2 2.9	5 7.1	-	-	3 4.3	-	-	1 1.4	70
Total	N	1	30	1	9	36	2	17	10	6	7	1	2	3	125

[1] See Figure 3-10 for key to type names.

Table 3-27. Historical projectile point type distribution, Area 5/6 (Housepit 1 area), 45-OK-11.

Zone	Historical Type[1]													Total
	15	21	22	23	31	41	51	52	53	61	62	63	64	
51	-	-	-	-	-	-	-	-	-	-	-	-	1	1
52	-	-	-	1	1	-	3	2	1	-	-	-	1	9
53,61	-	7	-	1	3	-	-	1	2	2	1	-	-	17
54	-	2	-	-	3	-	-	-	-	-	-	-	-	5
55,62 63,64	-	2	-	-	2	-	-	-	-	-	-	-	-	4
56,65	-	1	-	-	4	1	2	-	-	-	-	-	-	8
Total	-	12	-	2	13	1	5	3	3	2	1	-	2	44

[1] See Figure 3-10 for key to type names.

Table 3-28. Historical projectile point type distribution, Area 4, 45-OK-11.

Zone	Historical Type[1]													Total
	15	21	22	23	31	41	51	52	53	61	62	63	64	
41	-	-	-	-	-	-	3	-	-	-	-	1	-	4
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	-	6	-	-	2	-	-	-	-	-	-	-	-	8
44	-	-	-	1	-	1	-	-	-	-	-	-	-	2
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Total	1	6	-	1	2	1	3	-	-	-	-	1	-	15

[1] See Figure 3-10 for key to type names.

phase assemblages. This context, and the radiocarbon dates defining the two cultural components, suggests a very short period of time separating the deposition of the assemblages of the two phases--perhaps as little as 150-200 years. Plates 3-1 and 3-2 illustrate the distribution of projectile point types in the Housepit 1 block excavation and in the site as a whole. Only those points associated with a defined feature are shown.

A large portion of the projectile points in the collection were made on jasper flakes (32%) (Table 3-29). Opal (20%), chalcedony (14%), fine-grained basalt (12%) comprise other frequent material types. Basalt, quartzite, petrified wood, although common, constitute only 16% together. Over 85% of all corner-notched and basal-notched projectile points are of cryptocrystalline stone; lanceolate and side-notched points never exceed 64% cryptocrystalline. Basalt, fine-grained basalt, and fine-grained quartzite are common materials for the earlier lanceolate and side-notched projectile point types (basalt--10%; fine-grained basalt--16%; fine-grained quartzite--6%). Twenty seven percent of the Cascade point types are made of basalt and fine-grained basalt, a characteristic noted by Leonhardy and Rice (1970).

Twenty-one projectile points in the collection were identified as having been made on blades (Table 3-30), 16% of the total and 25% of the lanceolate point types. If shouldered lanceolates are not considered, 36% of the Cascade types appear to have been made on blades. In fact, only one non-lanceolate point type was identified as a possible blade: a Type 51 Nespelem Bar recovered from the uppermost zone in excavation Area 4. A high incidence of Cascade types on blades is considered a diagnostic characteristic and evidence of the Levallois-like reduction technique identified in the Cascade Phase (Leonhardy and Rice 1970; Bense 1972; Muto 1976).

Serrated margins are confined almost completely to the Rabbit Island Series points (Types 51, 52, 53), although isolated examples occur in the Cascade C and Columbia Corner-notched B categories. It is most common in Rabbit Island B, where 71% of the recovered specimens have serrated margins.

Evidence of burning and possible heat treatment was not common in any projectile point type, with the highest percentages occurring in the shouldered lanceolate (14%), Nespelem Bar (19%), and Rabbit Island B (14%) categories. Whether this classification represents heat treatment or simple introduction to fire we cannot say.

Flaking pattern does not provide any real separation in the historic projectile point types, except at the most general level, where we can say that fine collateral and transverse flaking occurs only in the Cascade and Mahkin Shouldered varieties (Table 3-31). Yet, even here, only 7% show collateral or transverse flaking, with a high of 12% in Cascade A. Easily the most common flake scar patterns in all types are variable and mixed, although mixed does occur in greater frequency in the Cascade A (50%) and Mahkin Shouldered (34%) categories.

Tabulation of attributes considered diagnostic of Cascade type projectile points (cf., Butler 1962; Nelson 1969; Leonhardy and Rice 1970) has produced the following results: the earlier Cascade and Mahkin Shouldered varieties show a higher proportion of specimens made of basalt and fine-grained basalt; Cascade types commonly appear to have been made on blades; only Cascade types

Table 3-29. Historical projectile point type by material, 45-OK-11.

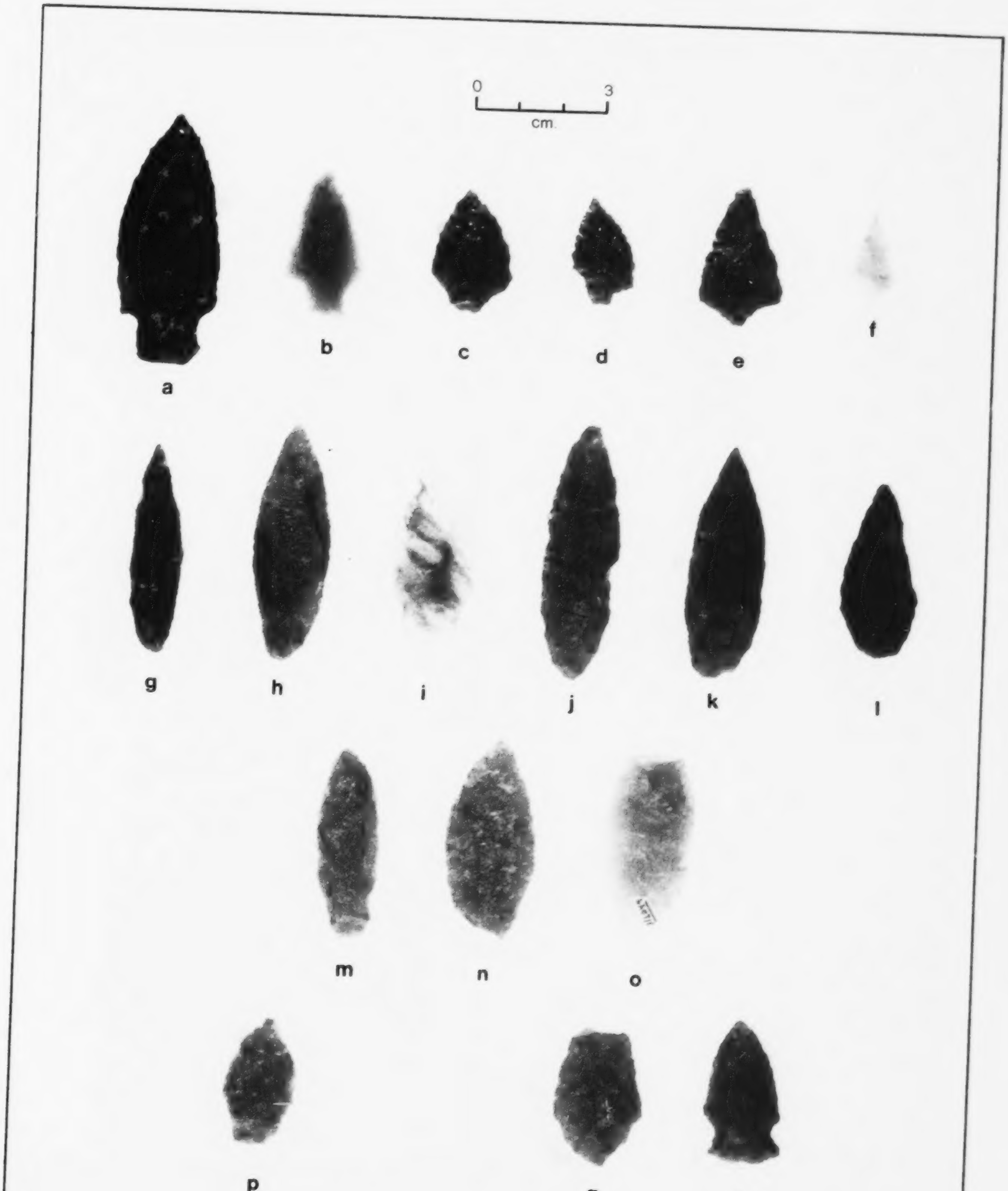
Material	Historical Type[1]													Total
	15	21	22	23	31	41	51	52	53	61	62	63	64	
Jasper	–	12	–	1	15	–	5	4	1	2	–	1	2	43
Opal	–	2	–	1	2	–	12	4	5	–	–	1	–	27
Chalcedony	–	4	1	2	6	–	2	1	–	2	–	–	1	19
Petrified wood	–	2	–	–	1	–	–	1	–	2	1	1	–	8
Quartzite	–	–	–	–	2	–	–	–	–	–	–	–	–	2
Fine-grained quartzite	–	2	–	1	2	–	–	1	–	–	–	–	–	6
Basalt	–	4	–	1	2	1	–	–	–	–	–	–	–	8
Fine-grained basalt	1	4	–	2	5	1	2	–	1	–	–	–	–	16
Argillite	–	–	–	1	1	–	–	–	–	–	–	–	–	2
Other	–	1	–	–	–	–	–	–	–	1	–	–	–	2
Total	1	31	1	9	36	2	21	11	7	7	1	3	3	133

[1] See Figure 3-10 for key to type names.

KEY

	Master number:	Morphological type:	Historical type:	Provenience/level:	Zone	Feature Association:	Material:
a.	899	6	Mahkin Shouldered	76N65E/70/F100	53	Upper Housepit 1 Fill	Jasper
b.	1741	11	Columbia Corner-notched A	75N72E/80/F100	53	Upper Housepit 1 Fill	Jasper
c.	897	7	Nespelem Bar	76N65E/60/F100	52	Upper Housepit 1 Fill	Fine-grained basalt
d.	1583	8	Rabbit Island A	81N70E/70/F100	53	Upper Housepit 1 Fill	Jasper
e.	1158	7	Rabbit Island B	78N67E/80/F100	53	Upper Housepit 1 Fill	Fine-grained basalt
f.	1195	8	Rabbit Island B	77N67E/80/F100		Upper Housepit 1 Fill	Opal
g.	1497	5	Cascade C	80N70E/120/F100	61	Upper Housepit 1 Fill	Jasper
h.	1109	5	Lanceolate	82N66E/120/F100,103	61	Upper Housepit 1 Fill	Jasper
i.	966	6	Mahkin Shouldered	77N66E/90/F100	53	Upper Housepit 1 Fill	Chalcedony
j.	1577	5	Cascade A	82N71E/80/F100	53	Upper Housepit 1 Fill	Jasper
k.	1620	5	Cascade A	78N70E/80/F100	53	Upper Housepit 1 Fill	Jasper
l.	974	5	Cascade A	82N65E/80/F100	53	Upper Housepit 1 Fill	Basalt
m.	1570	6	Mahkin Shouldered	83N71E/120/F101,104	65	Lower Housepit 1 Fill	Jasper
n.	1516	5	Lanceolate	84N71E/60/F104	62	Lower Housepit 1 Fill	Jasper
o.	1044	5	Lanceolate	76N66E/150/F104	62	Lower Housepit 1 Fill	Chalcedony
p.	1145	6	Mahkin Shouldered	83N67E/160/F101	65	Lower Housepit 1 Floor	Jasper
q.	1749	7	Mahkin Shouldered	75N73E/110/F6	65	Lower Housepit 1 Wall	Jasper
r.	1795	3	Cold Springs Side-notched	80N73E/130/F6	65	Lower Housepit 1 Wall	Basalt

Plate 3-1. Historical projectile point types in Housepit 1, 45-OK-11, arranged stratigraphically.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KEY
Master Number:
Morphological Type:
Historical Type:
Provenience/Level:
Zone:
Feature Association:
Material:

a.
1666
5
Lanceolate
77N71E/80/F55
53
Occupation Surface
Jasper

b.
334
6
Mahkin Shouldered
23N67E/200/F154
24
Occupation Surface
Coarse-grained quartzite

c.
357
5
Lanceolate
23N69E/180/F154
24
Occupation Surface
Jasper

d.
2818
6
Mahkin Shouldered
5S75E/200/F41
12
Shell Concentration
Coarse-grained quartzite

e.
2028
6
Mahkin Shouldered
42N72E/20/F23,500
12
Housepit 7 fill
Petrified wood

f.
2625
7
Nespelem Bar
15N69E/190/F38
24
Shell concentration
Jasper

g.
456
5
Cascade C
33N61E/130/F200
44
Housepit 4 Fill
Fined-grained basalt

h.
424
3
Cold Springs Side-notched
34N60E/150/F200
44
Housepit 4 Fill
Fine-grained basalt

i.
1816
6
Mahkin Shouldered
74N74E/80/F90
54
Housepit 12 Fill
Fine-grained basalt

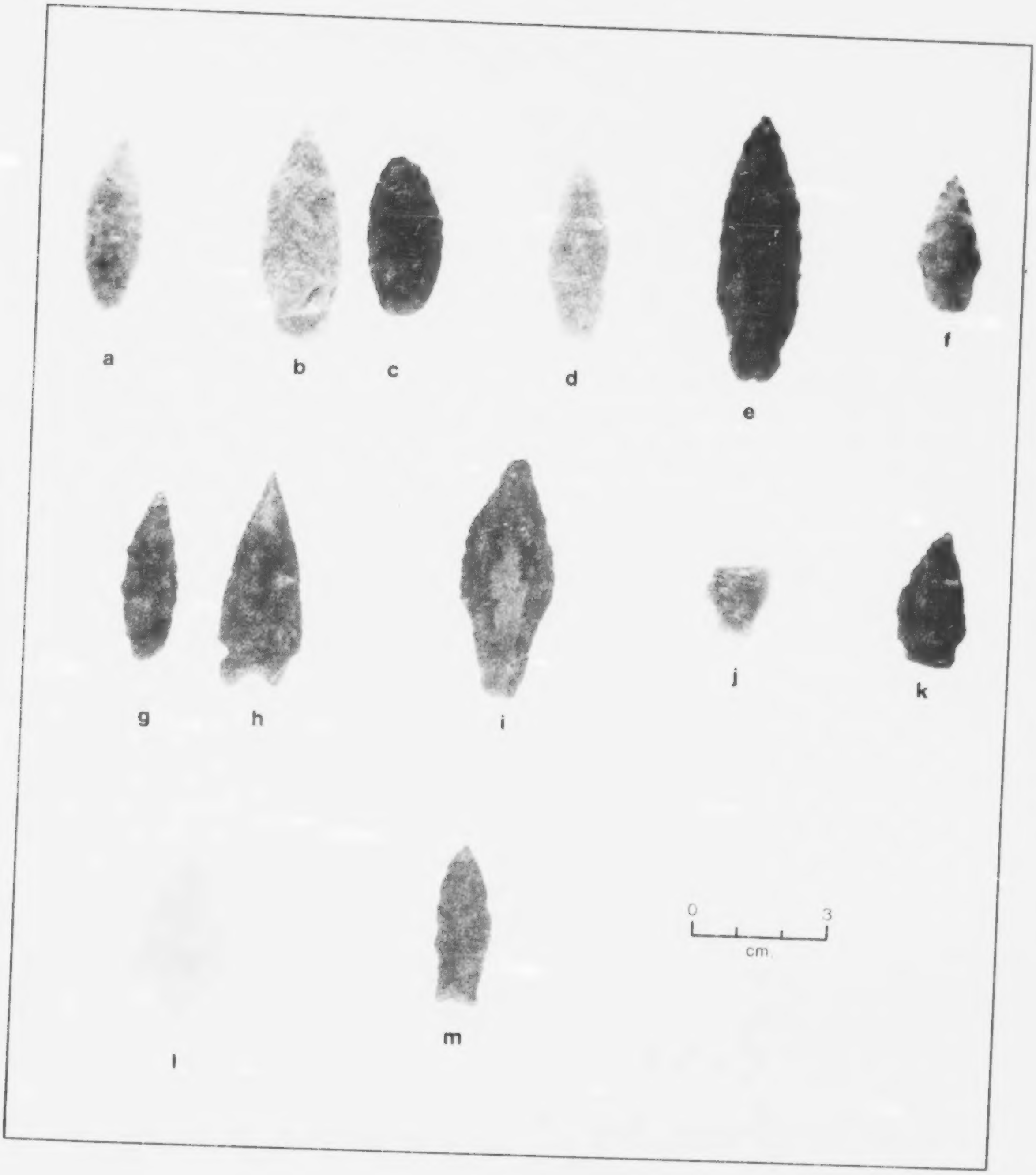
j.
2169
7
Nespelem Bar
116N74E/70/F3
72
Bone Concentration
Jasper

k.
889
6
Mahkin Shouldered
71N64E/140/F67
64
Housepit 7 Fill
Fine-grained basalt

l.
2000
17
Unassigned
42N67E/200/F403
12
Housepit 6 Lower Floor
Jasper

m.
1019
6
Windust Concave-base
31N65E/185/F185
46
Early Occupation Surface
Fine-grained basalt

Plate 3-2. Historical projectile point types from other features in the Kartar Phase Component, 45-OK-11, arranged stratigraphically.


a
b
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0
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cm

Table 3-30. Historical projectile point type[1], selected diagnostic attributes, 45-OK-11.

Material	Made on Blade					Serrated						Burned						
	Historical Type				Total	Historical Type					Total	Historical Type						Total
	21	23	31	51		23	51	52	53	63		21	31	51	52	53	63	
Jasper	5	1	2	–	8	–	1	1	1	1	4	2	5	2	1	–	1	11
Opal	2	–	–	–	2	–	3	1	4	–	8	–	–	1	–	1	–	2
Chalcedony	–	1	–	–	1	1	1	–	–	–	2	1	–	1	–	–	–	2
Petrified wood	–	–	1	–	1	–	–	–	–	–	–	1	–	–	–	–	–	1
Fine-grained quartzite	–	–	1	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–
Basalt	1	1	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–
Fine-grained basalt	1	2	–	1	4	1	–	–	–	–	1	–	–	–	–	–	–	–
Argillite	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Other	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Total	10	5	5	1	20	2	5	3	5	1	16	4	5	4	1	1	1	16

[1] See Figure 10 for key to type names.

Table 3-31. Flaking pattern by historical projectile point type, 45-OK-11.

Flaking Pattern	Historical Type[1]													Total
	15	21	22	23	31	41	51	52	53	61	62	63	64	
Variable	1	12	1	5	20	1	16	9	4	4	1	2	2	78
Uniform	–	–	–	1	–	–	–	–	–	–	–	–	–	1
Mixed	–	16	–	2	13	1	3	–	2	1	–	–	1	39
Collateral	–	3	–	1	1	–	–	–	–	–	–	–	–	5
Transverse	–	1	–	–	–	–	–	–	–	–	–	–	–	1
Indeterminate	–	–	–	–	4	–	–	–	–	1	–	–	–	5
Total	1	32	1	9	38	2	19	9	6	6	1	2	3	129

[1] See Figure 3-10 for key to type names.

show fine collateral and transverse flaking and more often show a mixed flake scar pattern. The specimens identified as Rabbit Island Series, Columbia Corner-notched, Quilomene Bar Corner-notched, and Wallula Rectangular-stemmed are more often made from cryptocrystalline stones, are characteristically made on flakes, and tend to be less carefully reduced.

Thirty-two of 131 projectile point fragments recovered from the site (Table 3-10) are sufficiently intact to be assigned morphological codes (Table B-1). These have been classified to morphological types but have not been subjected to discriminant analysis. Those examples which are only blade fragments are difficult to classify, but fragments of stems or hafting elements provide fairly reliable indicators of type affiliation.

Plate 3-3 shows the distribution of fragments by area-zone and cultural component. The Hudnut Phase is marked by shouldered and stemmed triangular fragments, while the Kartar Phase is characterized by lanceolate blades and bases. The stratigraphic distribution of projectile point fragments thus closely mirrors the placement of historical point types. Further, lanceolate fragments clearly mark Analytic Zone 53 and perhaps Analytic Zone 52 as transitional between the Kartar and Hudnut Phase occupations. The stemmed triangular fragment (Plate 3-3;dd), from the floor of Housepit 12 (Analytic Zone 64) which is roughly dated betweeen 5000-4700 B.P., confirms the early provenience of the stemmed triangular point (Plate 3-2;e) from the floor of Housepit 6 and radiocarbon dated at 4757±157 B.P. The basally notched stem from Analytic Zone 35 (Plate 3-3;t) is quite similar to a recognized Windust type (cf., Rice 1965; Rice 1969, 1972; Leonhardy and Rice 1970) and could indicate a very early occupation in the project area. A radiocarbon date of 5171±151 B.P. (B-4292) from the Feature 122 living surface in Analytic Zone 35 makes it doubtful that this point, if Windust, is in primary context. It certainly could have been picked up from an older surface by site inhabitants. Also, the small size of the stem fragment and its rather squat appearance are rather atypical of defined Windust forms. The evidence suggests, then, that this point, like the large, stemmed triangular points, may represent an undefined type or type variant indicative of the latter part of the Kartar

KEY:
Master Number:
Morphological Type:
Provenience/Level:
Zone:
Material:

a.	b.	c.	d.	e.	f.	g.
76	2716	2762	2723	2767	962	1661
8	8	8	Unassigned	Unassigned	Unassigned	Unassigned
61S65E/20	6S70E/70	4S74E/30	6S71E/30	4S74E/70	77N64E/30	74N73E/30
11	11	11	11	11	51	52
Jasper	Jasper	Jasper	Jasper	Jasper	Jasper	Jasper

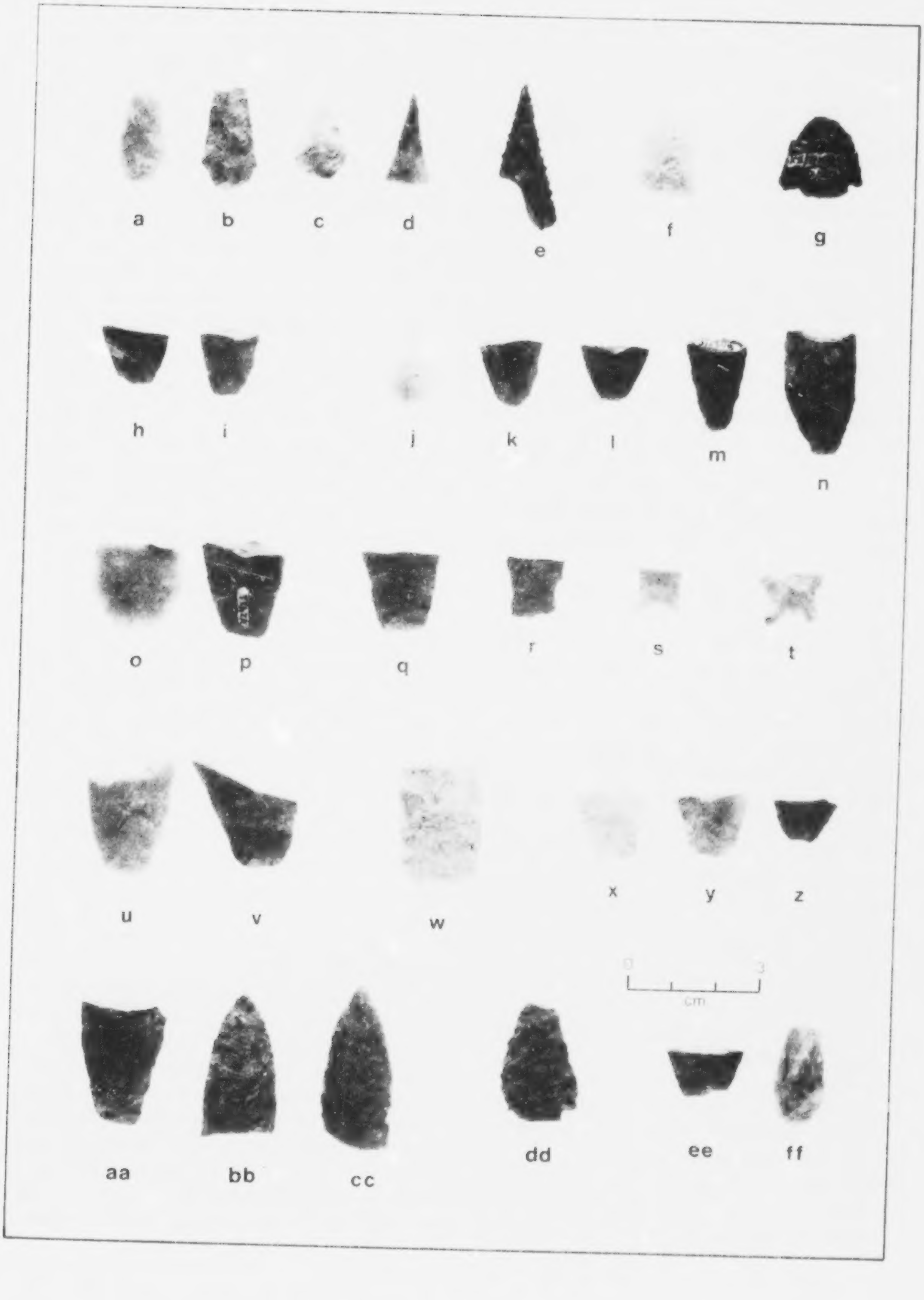
h.	i.	j.	k.	l.	m.	n.
898	1781	1192	900	956	1348	1788
Unassigned	Unassigned	8	Unassigned	Unassigned	Unassigned	5
76N65E/60/F100	77N73E/60/F100	77N67E/80/F28	76N65E/70/F100	78N65E/80/F100	78N69E/100/F100	80N72E/100
52	52	53	53	53	56	53
Fine-grained basalt	Jasper	Opal	Fine-grained basalt	Jasper	Fine-grained basalt	Jasper

o.	p.	q.	r.	s.	t.
1949	2411	2541	2481	2508	1937
6	Unassigned	6	Unassigned	6	6
59N68E/110/F250	31N54E/90	19N55E/70	22N66E/150/F450	20N55E/110	16-22N58-61E/150-220
12	12	23	24	23	35
Jasper	Jasper	Jasper	Basalt	Jasper	Jasper

u.	v.	w.	x.	y.	z.
453	992	773	1122	1472	1053
5	Unassigned	6	Unassigned	Unassigned	Unassigned
33N61E/110	32N64E/110	83N60E/70/F5	81N66E/130/F100	77N69E/120/F100	76N67E/130/F31-100
43	43	54	61	61	61
Jasper	Opal	Jasper	Opal	Jasper	Jasper

aa.	bb.	cc.	dd.	ee.	ff.
1459	1334	1435	651	2225	2283
5	Unassigned	Unassigned	Unassigned	Unassigned	5
79N69E/140/F31	78N68E/140/F31	79N68E/145/F31	71N60E/160/F75	127N78E/80	104N67E/40
61	61	61	64	82	82
Jasper	Jasper	Jasper	Jasper	Fine-grained basalt	Jasper

Plate 3-3. Classified projectile point fragments, 45-OK-11, arranged stratigraphically.


a
b
c
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e
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g
h
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k
l
m
n
o
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q
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s
t
u
v
w
x
y
z
0
3
cm
aa
bb
cc
dd
ee
ff

Phase. If this specimen does date to the period from about 5400-5000 B.P., or the earliest dated evidence of occupation at the site, it may have correlates in the McKean-Duncan-Hanna continuum identified on the Plains (Wheeler 1952, 1954; Reeves 1969). Similar forms are attributed to the Calx Phase (ca. 4500-3300 B.P.) in the Kootenai Canyon (Roll 1982) and the Slawntehus Period (ca. 7500-5500 B.P.) at Kettle Falls (Chance 1982).

In summary, Cascade types, Cold Springs Side-notched, and the Mahkin Shouldered type characterize the lower Kartar Phase component, and exhibit all the hallmarks of those projectile point types defined for the Cascade Phase. Rabbit Island stemmed, Columbia Corner-notched, Quilomene Bar Corner-notched, and Waliula Rectangular stemmed types mark the upper Hudnut Phase component, and seem reliable correlates of those types characteristic of early and late Tucannon in the lower Snake River region and Frenchman Springs Phases in the Vantage region.

COBBLE TOOLS

Excavation at 45-OK-11 produced a collection of 419 cobble tools. The majority (82%) were found in the lower cultural component. Specimens range from a possible core and utilized flakes and spalls to flaked, pecked, and ground formed objects. Choppers and hammerstones are the most common elements. The varied nature of this assemblage, the size of the collection relative to those of other sites in the project area, and the possible temporal diagnostic significance prompted us to develop a classification independent of that presented in the preceding technological and functional sections. We discuss these tools at some length because a cobble tool industry is held to characterize Cascade Phase assemblages (cf., Leonhardy and Rice 1970; Bense 1972).

Our discussion is based on a paradigmatic classification very like that used in the preceding sections. Differences include the larger number of functional types established for cobble tools, and more associated dimensions and attributes keyed to description of cobble tool forms. Table 3-32 presents a complete list of classificatory dimensions and attributes. We were only partly successful in our attempt to describe the cobble tool assemblage. We can describe tool types by diagnostic attributes of manufacture, wear, and overall configuration, but we cannot adequately establish the relationship of manufacture and wear on a single cobble. These forms are asymmetrical, lack obvious, consistent landmarks, and exhibit endless variation in shape and in the number and association of discrete patterns of wear and manufacture. Nor have we a reliable way to separate wear from manufacture. Examples which are clearly either manufacture or wear are common, but the vast majority of cobble tools fall into the grey area between them. By describing the obvious morphological characteristics and diagnostic elements of manufacture and wear, we will be able to sort out significant patterns comparable to those defined by prior researchers. But we must acknowledge that, short of describing every specimen individually, we are forcing a broad range of variation into very stiff, confined categories that may not reflect the actual use of these tools. Moreover the majority of these tools were used for a great many tasks, some

Table 3-32. Cobble tool classification.

DIMENSION I: OBJECT TYPE

Utilized flake
Unifacially retouched flake
Bifacially retouched flake
Resharpening flake
Utilized spall
Core
Anvil
Biface
Chopper
Edge ground cobble
Hammerstone
Hopper mortar base
Maul
Millingstone
Mortar
Net weight
Peripherally flaked cobble
Pestle
Tabular knife
Indeterminate

DIMENSION II: MATERIAL

Basalt
Quartzite
Granitic
Porphrytic
Other

DIMENSION III: SIZE

Length - mm
Width - mm
Thickness - mm

DIMENSION IV: TOOL AREAS (1-9)

DIMENSION V: WEAR AREAS (1-9)

DIMENSION VI: MANUFACTURE

Flaked surface
Flaked edge/margin
Flaked end
Pecked surface
Pecked edge/margin
Pecked end
Ground surface
Ground edge/margin
Ground end
None
Indeterminate

DIMENSION VII: DIAGNOSTIC OF MANUFACTURE

Unifacial edge
Bifacial edge
Facet
Beveled facet
Convex surface
Flat surface
Concave surface
Point
Notch
Girdle
Well
None
Other

DIMENSION VIII: WEAR LOCATION-NO MANUFACTURE

Surface
Edge (natural or flaked)
End
Margin
Not applicable

DIMENSION IX: WEAR

Polishing
Smoothing
Battering
Crushing
Abrasion
Grinding
Flaking
None
Indeterminate

DIMENSION X: WEAR LOCATION-MANUFACTURE

Proximal edge
Distal edge
Lateral edge
Adjacent edge
Separate
Whole facet
Partial facet
Not applicable/Indeterminate

DIMENSION XI: WEAR LOCATION-COBBLE

Cortex
Interior
Interface
Not applicable/Indeterminate

requiring purposeful shaping of the cobble, but most simply calling for the use of any available round rock. It might be argued that diagnostics presented here are products of sustained, controlled use, wherein facets, bevelled facets, wells, etc., are by-products of function, and not manufactured or functionally designed features. The number of separate wear patterns typical of each cobble tool supports this. In the discussion that follows, however, we have assigned each cobble a single manufacture or wear classification irrespective of the number of identical, separate areas of manufacture or wear on the stone. Separate tools are counted only if areas of manufacture or wear are distinctly different.

Most of the cobble tools were made either of basalt (32%) or unidentified metamorphic and igneous stones (28%) (Table 3-33). Quartzite (19%) and granite (17%) occur in lower frequencies, with the lowest number of specimens in the porphyrtic igneous category (3%). There does not seem to be a clear preference in the use of particular stones for certain tools or classes, except in the categories subsumed under "utilized flake spall", which could be assumed to be material-dependent at the outset. It may be that size or shape of the naturally occurring cobble was more critical, since crude chopping chores do not require especially sharp flaked edges, and hammers need only be of a dense material. Of course, another concern would be the strength or durability of the tool edge or surface; the materials analysis presented here, however, is not so finely discriminant. We have noted already that the two cultural components differ in terms of stone selection: basalt and quartzite predominate in the Kartar Phase assemblage, while granite and other stones, are most common in the upper Hudnut Phase assemblage.

The majority of cobble tools in both components show no manufacture (Table 3-34). This is most marked in the Hudnut component, where types of manufacture do not exceed 16% in any category. Unifacial edges in the Kartar component, however, comprise 41% of the tool assemblage, a percentage reflected by the much higher frequency of flaked choppers (Table 3-35). Most cobbles were either utilized as found or reduced to a steep unifacial edge for chopping or cutting. More intensive reduction is rare, indicating a preference for tools of the moment. Neither component has very many cobbles with facets and bevelled facets; most of these fall in the pestle and hammer classes. Listed here as the result of manufacture, these could just as easily be products of wear. Flaking is the most common kind of manufacture, accounting for 56% of the cobble tools in the Kartar component, and 34% of the cobble tools in the Hudnut component. Pecking amounts to just 6% of the manufactured cobbles noted in the Kartar component and 14% of those in the Hudnut component. Flaking is an important characteristic of choppers, flake spalls, and some indeterminate forms. It also was used to fashion many of the anvils, milling stones, and hopper mortar bases. Pecking spans a broader range of functional types but appears characteristic of only the mauls and pestles. Further, pecking as a form of manufacture is much less frequent in the Kartar component, probably not as a consequence of a shift in manufacturing technique but of the much wider range of tool forms. Those forms that characteristically were pecked in the Hudnut component, i.e., mauls and pestles, also were made by pecking in the lower component.

Table 3-33. Cobble tool type by material group, 45-OK-11.

Cobble Tool Type	Basalt		Quartzite		Granitic		Porphyritic		Other		Total	
	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut
Utilized flake/spall	17	3	15	2	–	1	–	–	9	4	41	10
Peripherally flaked cobble	–	–	–	–	5	–	–	–	3	–	8	–
Amorphously flaked cobble	5	–	1	–	–	–	–	–	2	–	8	–
Chopper	75	6	56	1	5	2	6	1	44	6	186	16
Hammerstone	7	1	2	2	16	8	–	2	16	16	41	29
Edge-ground cobble	–	–	–	–	–	–	2	–	1	1	3	1
Maul	3	–	1	1	–	1	–	–	1	–	5	2
Pestle	2	1	–	–	–	1	–	–	1	1	3	3
Anvil	4	–	–	–	12	3	–	–	5	1	21	4
Millingstone	–	–	–	–	4	–	–	–	1	–	5	–
Hopper mortar base	–	–	–	–	7	–	–	–	1	–	8	–
Netsinker		–	–	–	–	1	–	–	–	–	1	1
Indeterminate	7	3	1	–	3	3	–	–	2	3	13	9
Total	121	14	76	6	52	20	8	3	86	32	343	75

Table 3-34. Cobble tool type by type of manufacture[1], 45-OK-11.

Cobble Tool Type	Flaked Surface		Flaked End/ Margin		Flaked End		Pecked Surface		Pecked end/ Margin		Pecked End		None		Indeterminate		Total	
	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut
Utilized flake/spall	5	-	22	2	-	-	-	-	-	-	-	-	20	8	1	-	48	10
Peripherally flaked cobble	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
Amorphously flaked cobble	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	8	-
Chopper	26	4	164	13	3	2	-	-	3	-	2	-	59	6	-	-	257	25
Hammerstone	-	-	1	-	-	-	-	-	1	1	2	1	44	29	-	-	48	31
Edge-ground cobble	-	-	1	-	-	-	-	-	3	1	2	1	-	-	-	-	6	2
Maul	2	-	2	-	-	-	-	1	-	1	-	-	5	1	-	-	9	3
Pestle	-	-	-	-	-	1	2	-	3	1	1	3	-	1	-	-	6	6
Anvil	-	-	6	3	-	-	-	-	-	-	-	-	15	1	1	-	22	4
Millingstone	-	-	2	-	-	-	4	-	-	-	-	-	-	-	-	-	6	-
Hopper mortar base	-	-	4	-	-	-	-	-	-	-	-	-	5	-	-	-	9	-
Netsinker	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	-	1	2
Indeterminate	-	2	2	5	1	1	-	2	3	1	-	-	7	2	2	-	15	13
Total	33	6	213	23	4	4	6	3	13	6	7	5	163	49	4	-	443	96

[1] Frequencies in Table 3-34 exceed those in Table 3-35 because each tool on a specimen is counted seperately.

Table 3-35. Cobble tool type by diagnostic of manufacture, 45-OK-11.

Cobble Tool Type	Unifacial Edge		Bifacial Edge		Facet		Beveled Facet		Convex Surface		Flat Surface		Notch		Wel:		None		Other		Total	
	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut	Karter	Hudnut
Utilized flake/spall	16	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	21	8	-	-	44	10
Peripherally flaked cobble	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
Amorphously flaked cobble	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	1	-	8	-
Chopper	135	10	31	3	1	-	-	-	-	-	-	-	1	-	3	-	55	6	-	-	226	19
Hammerstone	-	-	-	-	2	1	2	1	-	-	-	-	-	-	-	-	44	28	-	-	48	31
Edge-ground cobble	1	-	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	1
Maul	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	5	1	-	-	7	2
Pestle	-	-	-	1	3	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	5
Anvil	5	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	15	1	1	-	22	4
Millingstone	2	-	-	-	-	-	-	-	1	-	3	-	-	-	-	-	-	-	-	-	6	-
Hopper mortar base	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	9	-
Netsinker	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	-	-	1	2
Indeterminate	1	1	-	4	2	1	-	-	-	2	-	-	-	-	-	-	7	2	4	-	14	10
Total	165	14	47	10	12	6	2	2	1	2	3	-	2	1	3	-	159	48	6	-	400	84

Table 3-36 presents a description of the kind of wear and the location of wear by cobble tool type. Choppers reveal the most variability in kinds and locations of wear. Kinds of wear (with the exception of grinding) are what we would expect on heavy chopping and hammering tools often used in conjunction with a base or anvil. The extremely variable location of the wear, however, is intriguing. Specimens have wear all along flaked margins; wear extending past areas of flaking onto adjoining surfaces; instances of battering on an end completely separated from the flaked edges; and, perhaps most perplexing, areas of grinding and abrasion at the distal end of flake scars, where these terminate at the intact surface of the cobble, well away from the sharp unifacial or bifacial edge. Several also have grinding or abrasion extending up arrises, following the margins of flake scars on one unifacial surface, overlapping onto the surface itself, but not extending onto the flaked edge which shows expected crushing and battering. These tools appear to have had multiple uses, and, more than that, no consistent mode of use. They seem to have served as choppers, hammers, abraders, and, perhaps, hand milling stones.

The wear patterns on hammerstones are similar, although less complex, and fewer of these are the result of grinding or abrasion. Wear patterns on pestles and mauls are largely predictable. One point of interest is the occurrence of ground or polished facets along the lateral margins of several pestles, extending from working end to working end. Like choppers, these pestles probably had at least two uses--crushing, perhaps associated with use of a hopper mortar base; and grinding in the manner of a hand milling stone likely associated with a grinding slab.

Other cobble tools by and large exhibit normal patterns of wear associated with traditionally postulated uses. An exception is the indeterminate category, which contains quite a range of variation in shape, manufacture, and wear pattern. These are primarily hand-sized, rounded cobble tools, with wear patterns very like both choppers and hammerstones, and exhibiting some aspects of the complex associations of grinding, abrasion, and battering described above.

Another exception is the ubiquitous edge-ground cobble (cf., Crabtree and Swanson 1968; Simms 1971; Bense 1972). Specimens in our collection are similar to the choppers and hammerstones in configuration, but lack flaking or extensive battering. They exhibit facets along two or more lateral margins or ends, apparently a product of grinding and crushing-battering. Along some parts of the facets are striae, which are either oblique or parallel to the longer axes of the cobble. Wear is not entirely grinding, as crushing or massive attrition form parts of the encircling facets. Use is problematical, although it seems certain that these forms were created by some combination of crushing, battering, and grinding. Butler (1962) found similar forms in association with a milling slab at Weis Rockshelter, and suggested that they were a form of hand millingstone. Our specimens seem to partially corroborate this inference. They certainly do not resemble the blade hammers described by Crabtree and Swanson (1968).

While we note considerable variablity in the wear patterns and manufacturing characteristics of these cobble tools, very few of them show separate, distinctly different patterns of wear (less that 3% of the total in

Table 3-36. Kinds of wear and locations of wear on cobble tool type, 45-OK-11.

Cobble Tool Type	Kind of Wear	Location of Wear	Kartar Component	Hudnut Component	Total
Utilized flake/ spall	Smoothing	Distal edge	3	–	3
		NA-Indeterminate	1	–	1
	Battering	NA-Indeterminate	3	1	4
	Crushing	Distal edge	8	–	8
		Laterial edge	1	–	1
		Separate	1	1	2
		NA-Indeterminate	14	5	19
	Abrasion	NA-Indeterminate	–	2	2
	Flaking	Separate	–	1	1
		NA-Indeterminate	4	1	5
	Indeterminate	NA-Indeterminate	1	–	1
	None	NA-Indeterminate	15	2	17
Peripherally flaked cobble	Battering	Separate	2	–	2
	Crushing	Separate	3	–	3
	None	NA-Indeterminate	3	–	3
Amorphously flaked cobble	Battering	NA-Indeterminate	1	–	1
	None	NA-Indeterminate	7	–	7
Chopper	Polishing	Distal edge	1	–	1
		NA-Indeterminate	1	–	1
	Smoothing	Proximal edge	10	1	11
		Distal edge	14	1	15
		Lateral edge	7	1	8
		Separate	8	1	9
		All facet	1	–	1
		NA-Indeterminate	5	–	5
	Battering	Proximal edge	3	–	3
		Distal edge	11	–	11
		Lateral edge	5	–	5
		Separate	7	–	7
		NA-Indeterminate	13	2	15
	Crushing	Proximal edge	17	–	17
		Distal edge	87	11	98
		Lateral edge	35	3	38
		Adjacent edge	6	–	6
		Separate	23	2	25
		NA-Indeterminate	33	3	36
	Abrasion	Proximal edge	1	–	1
		Distal edge	1	–	1
		Lateral edge	1	–	1
		Separate	2	–	2
		NA-Indeterminate	10	1	11

Table 3-36. Cont'd.

Cobble Tool Type	Kind of Wear	Location of Wear	Kartar Component	Hudnut Component	Total
Hammerstone	Grinding	Proximal edge	1	–	1
		Distal edge	4	1	5
		Lateral edge	3	–	3
		Separate	3	–	3
		All facet	1	–	1
		NA-Indeterminate	1	–	1
	Flaking	Distal edge	3	2	5
		Lateral edge	2	1	3
		Adjacent edge	1	–	1
		Separate	1	–	1
		NA-Indeterminate	4	–	4
	None	Lateral edge	1	–	1
		NA-Indeterminate	45	2	47
	Smoothing	Separate	1	–	1
		NA-Indeterminate	1	–	1
	Battering	NA-Indeterminate	16	6	22
	Crushing	Proximal edge	1	–	1
		Distal edge	1	–	1
		Lateral edge	1	–	1
		Separate	1	–	1
		All facet	2	–	2
		NA-Indeterminate	33	25	58
	Abrasion	NA-Indeterminate	2	–	2
	Grinding	Proximal edge	1	–	1
		Distal edge	1	–	1
		Lateral edge	1	–	1
		All facet	2	2	4
		NA-Indeterminate	2	3	5
	Flaking	All facet	1	–	1
Edge-ground cobble	Crushing	Distal edge	1	–	1
		All facet	3	–	3
	Grinding	Distal edge	1	–	1
		All facet	3	1	4
Maul	Smoothing	NA-Indeterminate	1	–	1
	Battering	Proximal edge	1	–	1
		Distal edge	1	–	1
		All facet	1	–	1
		Partial facet	1	–	1
	Crushing	Proximal edge	1	–	1
		Distal edge	2	–	2
		All facet	1	1	2
		Partail facet	1	–	1
		NA-Indeterminate	4	1	5
	Abrasion	NA-Indeterminate	1	–	1
	Grinding	Proximal edge	1	–	1
		Distal edge	1	–	1
		All facet	1	–	1
		Partial facet	1	–	1

Table 3-36. Cont'd.

Cobble Tool Type	Kind of Wear	Location of Wear	Kartar Component	Hudnut Component	Total
Pestle	Polishing	All facet	1	–	1
	Battering	Distal edge	–	1	1
		Separate	1	–	1
		All facet	1	–	1
		NA-Indeterminate	–	1	1
	Crushing	Distal edge	–	1	1
		Separate	1	1	2
		All facet	2	–	2
		Partial facet	1	1	2
		NA-Indeterminate	–	1	1
	Abrasion	All facet	1	–	1
	Grinding	Separate	–	1	1
		All facet	2	2	4
		Partial facet	1	1	2
Anvil	Battering	Separate	2	–	2
		All facet	1	–	1
		NA-Indeterminate	4	–	4
	Crushing	Separate	2	1	3
		NA-Indeterminate	8	1	9
	Abrasion	NA-Indeterminate	1	–	1
	Flaking	NA-Indeterminate	1	–	1
	None	NA-Indeterminate	1	2	3
	Indeterminate	NA-Indeterminate	2	–	2
Millingstone	Crushing	Seperate	1	–	1
	Grinding	All facet	4	–	4
	None	NA-Indeterminate	1	–	1
Hopper Mortar Base	Battering	Seperate	1	–	1
	Crushing	Distal edge	1	–	1
		Seperate	2	–	2
		NA-Indeterminate	5	–	5
Netsinker	Battering	NA-Indeterminate	–	1	1
	Crushing	Distal edge	1	–	1
	None	NA-Indeterminate	–	1	1
Indeterminate	Polishing	Separate	–	1	1
		All facet	1	–	1
	Smoothing	Distal edge	–	1	1
		Seperate	–	1	1
		All facet	2	–	2
		NA-Indeterminate	–	1	1

Table 3-36. Cont'd.

Cobble Tool Type	Kind of Wear	Location of Wear	Kartar Component	Hudnut Component	Total
	Crushing	Distal edge	2	1	3
		Separate	–	1	1
		All facet	3	1	4
		NA-Indeterminate	1	–	1
	Abrasion	NA-Indeterminate	–	2	2
	Grinding	Distal edge	2	–	2
		All facet	2	2	4
	Flaking	NA-Indeterminate	2	–	2
	None	NA-Indeterminate	–	3	3
	Indeterminate	NA-Indeterminate	3	–	3
Total			613	115	728

Table 3-37. Cobble tool type by number of wear areas, 45-OK-11.

Cobble Tool type	One Wear Area		Two Wear Areas		Total	
	Kartar	Hudnut	Kartar	Hudnut	Kartar	Hudnut
Utilized flake/spall	42	10	1	–	43	10
Peripherally flaked cobble	8	–	–	–	8	–
Amorphously flaked cobble	8	–	–	–	8	–
Chopper	220	19	7	1	227	20
Hammerstone	47	31	3	1	50	32
Edge-ground cobble	3	1	–	–	3	1
Maul	7	2	–	–	7	2
Pestle	3	5	–	–	3	5
Anvil	22	4	–	–	22	4
Millingstone	6	–	–	–	6	–
Hopper mortar base	9	–	–	–	9	–
Netsinker	1	2	–	–	1	2
Indeterminate	13	10	1	–	14	10
Total	389	84	12	2	401	86

both cultural components) (Table 3-37). Different kinds of wear are present, but in a complex overlay, enveloping areas of manufacture and adjacent surfaces. Facets, bevelled facets, or other characteristics, appear to be by-products of more than a single use, and not intentional, manufactured, functional elements.

Most of the cobble tools from either component assemblage are not diagnostic of any particular time period in Columbia Plateau prehistory. Pestles, mauls, anvils, millingstones, hopper mortar bases, etc., are very general forms characteristic of specific functions, but not of discrete time periods. The edge-ground cobbles are perhaps the best diagnostic indicator (associated with the Cascade Phase in the lower Snake River region), but these are not well-defined as an artifact class, except for the hallmark of an encircling facet, single or bevelled. While our examples do seem characteristic, they are also closely related to wear patterns seen in the broad chopper and hammerstone classes. Indeed, these artifacts seem to represent a continuum of form, manufacture, and use. If wear, grinding, crushing or some combination creates obvious facets, we can place the artifact in the edge-ground cobble category. If, however, battering is more extensive, the artifact is a hammerstone. If flaking is present, as well as crushing or battering, then the artifact is a chopper.

The larger, more varied cobble tool assemblage in the Kartar Phase component at 45-OK-11 is comparable to assemblages assigned to the Cascade Phase (cf. Leonhardy 1970; Leonhardy and Rice 1970; Bense 1972). We do have several examples of edge-ground cobbles. More importantly, we have a complex picture of manufacture and wear patterns involving choppers, hammerstones, and edge-ground cobbles, which seems to indicate closely related uses in an economy emphasizing the utilization of cobble tools. Much more extensive than in the subsequent Hudnut Phase assemblage, this industry seems to offer clear separation of two technological systems.

BONE ARTIFACTS

Of the 357 bone artifacts recovered from the two components of 45-OK-11, most are unidentifiable fragments of cut or polished sections of long bone. We can say nothing more of these fragments than that they represent some shaped object. Those artifacts complete enough to be classified are described below.

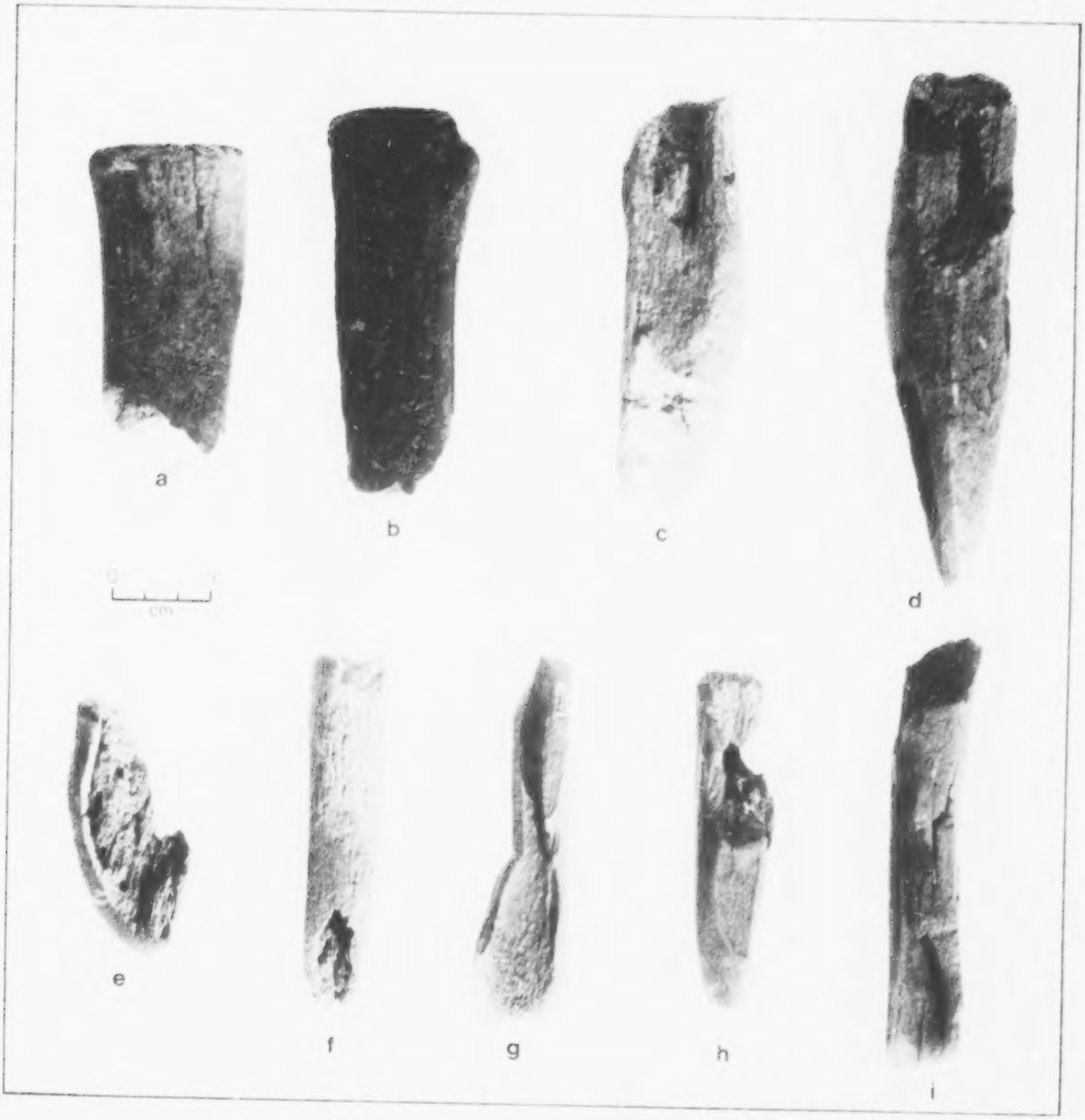
Wedges

Twenty-six antler wedges were recovered, including eight relatively complete specimens, 13 bit fragments, and three midsections (Plates 3-4 and 3-5). Table 3-38 indicates their condition and the nature of their manufacture. All show heavy use, with dulled, fragmented bits, and battered, chipped butt ends. All but two--split, unground antler wegdes--were recovered from the Kartar component. Specimens are generally medially split beam sections of antler or horn. Working edges or bits are predominantly bifacially ground, with manufacture extending a short distance along the longitudinal edges and

KEY

	Master number:	Tool:	Provenience/Level:	Zone:	Material:
a.	2828	Hammered antler section	Bulldozer Cut	Unassigned	Antler
b.	2829	Hammered antler section	Bulldozer Cut	Unassigned	Antler
c.	107	Wedge	24N67E/170	24	Antler
d.	353	Wedge	23N68E/220	25	Antler
e.	423	Wedge	34N60E/130/F200	44	Antler
f.	936	Wedge	33N65E/170/F180	45	Antler
g.	981	Wedge	81N65E/135.F100,103	61	Bone
h.	1055	Wedge	76N67E/130/F31	61	Bone
i.	1258	Wedge	82N68E/130/F98	62	Bone

Plate 3-4. Hammered antler sections and bone and antler wedges, 45-OK-11.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KEY

Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.	2659	Wedge	24S70E/50	11	Antler
b.	2814	Wedge	5S75E/80	11	Antler
c.	2046	Wedge	14N62E/140/F750	12	Antler
d.	2270	Wedge	35N61E/160/F200	44	Antler
e.	930	Wedge	34N65E/180/F181	45	Antler
f.	939	Wedge	80N65E/155/F31	61	Antler
g.	1531	Wedge	79N71E/135/F31	61	Antler
h.	2157	Wedge	115N77E/90	72	Antler
i.	2588	Wedge	8N57E/130	11	Antler
j.	2786	Wedge	4S74E/160	12	Antler
k.	2635	Chisel	10N70E/130	12	Bone
l.	1257	Chisel	82N68E/130/F31	61	Bone
m.	1150	Chisel	78N66E/140/F31	61	Bone
n.	1116	Chisel	82N67E/120/F104	62	Bone
o.	2128	Chisel	3N60E/180	12	Bone
p.	1759	Chisel	78N72E/130/F114	65	Bone
q.	127	Chisel	114N76E/70	72	Bone

Plate 3-5. Bone and antler wedges and chisels, 45-OK-11.

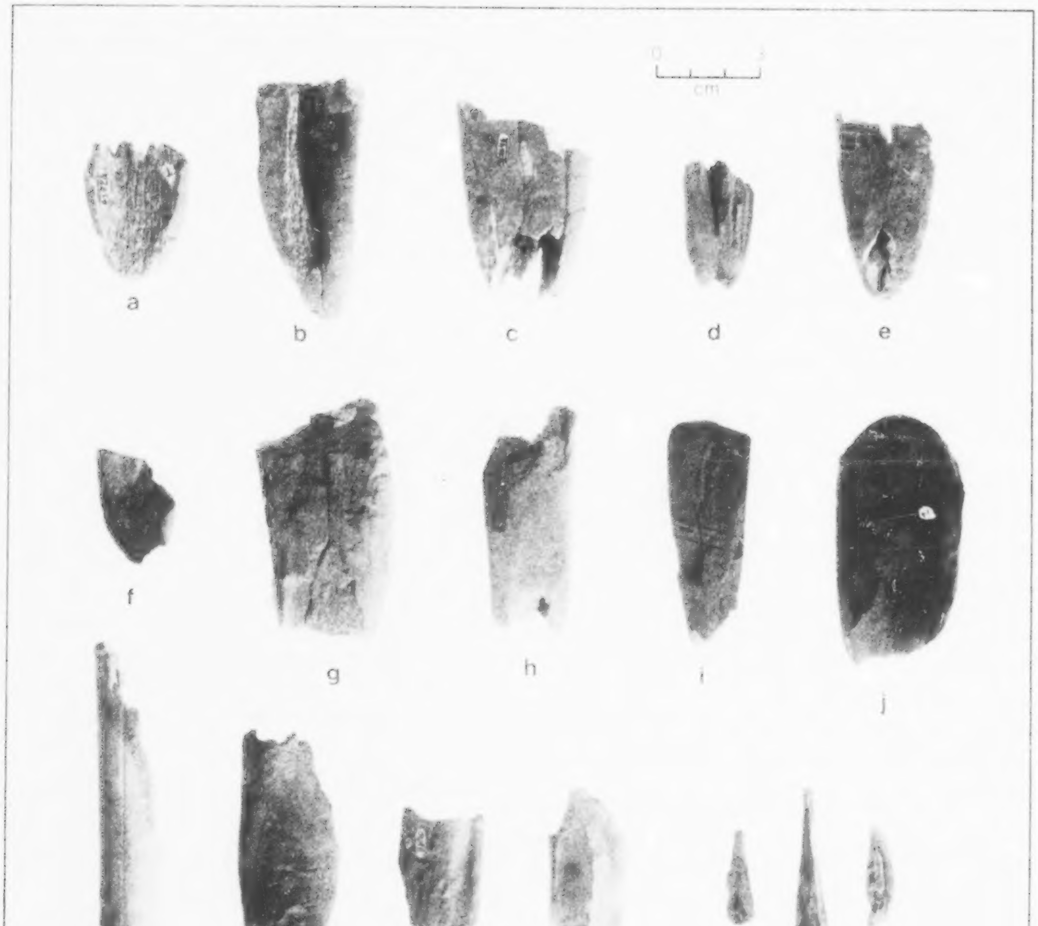
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Table 3-38. Wedge manufacture, 45-OK-11[1].

Material Treatment	Manufacture			Condition			Total
	Not Ground	Bifacially Ground	Unifacially Ground	Complete	Working End	Midsection	
Split long bone	–	2	–	–	2	–	2
Whole horn	–	2	–	–	2	–	2
Split antler	3	8	–	1	10	–	11
Whole antler	–	8	1	4	3	2	9
Total	3	20	1	5	17	2	24

[1] Those artifacts recovered during tesing or without provenience have not been included in the above counts.

part way up either surface. The hammered proximal ends or butts were not intentionally altered prior to use, but with repeated blows have assumed a mashed, rounded appearance, girdled by numerous small flake scars and spotted with various splinter scars extending down the long axes of the tools.

Splitting of the horn or antler segments appears to have been rather haphazard, with little attention given to the nature or location of the split other than to achieve a planar cross section. Choppers or adzes were probably used, singly or with a hammer to prepare sections for splitting by chopping around the circumference of the horn or antler at points above and below the desired length. Segments were usually removed some distance below the tine, often at or near the base, where the horn or antler was sufficiently thick to support a strong, broad working edge. Several examples, however, including both horn and antler, were made on or quite near the tip of the horn or antler tine, possibly reflecting care in utilizing as much of the raw resource as possible or in making a smaller, finer working edge for some more delicate job.

The preference for antler over horn in the manufacture of wedges probably is due to antler's greater structural strength. Antler is solid bone with no outer sheath. Horn consists of a bony core and an outer sheath of keratinlike material or agglutinated hairs. The bony cores contain large open spaces which result in a much more brittle by-product, one not nearly as durable as the dense antler wedge. The use of horn wedges probably indicates concern with expediency. Conversely, the prevalence of antler wedges evidences the more typical form of the industry, relying upon the more rugged material.

The badly worn, battered, fragmented nature of the wedges attest to hard use. When not broken laterally or splintered longitudinally, they acquire with use a squat, thick appearance. Spent wedges--those worn to such an extent they were too short to be useful--were abandoned. Those few which reached this stage attest to hard use on dense materials.

Antler wedges are a common element of prehistoric assemblages on the Columbia Plateau. Many authors have reported their occurrence, illustrating specimens similar to those described and shown here (Collier et al. 1942; Butler 1962; Nelson 1969; Bense 1972). They do not appear to be temporally restricted, appearing in assemblages characteristic of the Cascade Phase and earlier and later cultural phases. At 45-OK-11, they occur in both Hudnut and Kartar Phases (Table 3-39).

Table 3-39. Wedge distributions, 45-OK-11.

Material Treatment	Hudnut Component	Kartar Component	Total
Split long bone	–	2	2
Whole horn	–	2	2
Split antler	2	9	11
Whole antler	–	9	9
Total	2	22	24

Chisels

These tools are distinguished from wedges primarily on the basis of a keener cutting edge, and having been made on material other than horn or antler. Table 3-40 lists their condition and the nature of their manufacture. Specimens found at 45-OK-11 were produced on long bones and teeth; all of them were recovered from the Kartar component. They were split in a manner similar to that observed in the manufacture of wedges, and like wedges the bits are predominantly bifacially ground. Their butts or striking ends generally show heavy battering, but less than that observed for the wedges.

Table 3-40. Chisel manufacture, 45-OK-11.

Material Treatment	Manufacture			Condition		Total
	Not Ground	Bifacially Ground	Unifacially Ground	Complete	Fragment	
Split long bone	2	1	–	1	2	3
Whole long bone	–	1	–	1	–	1
Split antler	–	1	–	1	–	1
Whole antler	–	1	–	1	–	1
Split incisor	–	–	1	1	–	1
Total	2	4	1	5	2	7

In at least three instances, the label chisel may be a misnomer, since the specimens are small, with delicate, carefully ground bifacial edges. Perhaps more akin to incisors (meaning incising tool, not tooth), they have been classified as chisels because of some battering wear at the butt ends.

One of the chisel-incisors is made from a small, slender fragment of antler (Plate 3-5). The lateral margins have been left largely unfinished, with manufacture confined to one complete planar surface and the distal portion of the other. The working edge is formed by bifacial grinding and the edge itself shows a polished, rounded facet. Another small chisel is made on a long bone fragment. Manufacture is more extensive, encompassing both planar surfaces and at least one lateral margin (one lateral margin has been completely removed by a medial break). The working end has been bifacially ground and exhibits wear polish and sporadic nibbling. The other small chisel-incisor is a bifacially ground canine (Plate 3-5;g) which has been split, with manufacture extending part way up both planar surfaces. Wear is slight, limited to smoothing along the sharpened edge.

Two other chisels are large long bone fragments, shaped by flaking, with straight to slightly concave working edges showing heavy attrition. Another is a split long bone exhibiting slight bifacial grinding and extensive smoothing-polishing wear on both planar surfaces and extending some distance up both lateral margins. The fourth large chisel is an antler tine with the tip bifacially ground to form a flattened working edge. The edge shows heavy attrition in the form of stepped, hinged breaks and accompanying patches of smoothing-polishing.

Chisels are not commonly recorded for prehistoric assemblages on the Columbia Plateau. However, Nelson (1969) illustrates similar specimens (see also Leonhardy and Rice 1970). These tools are commonly assumed to have been used to shape and decorate wooden implements. Certainly, small chisel-incisors could have been used to create linear elements of decoration similar to those noted on ornaments and decorated bone fragments to be discussed later.

Hammered Antler Sections

Three charred specimens show heavy battering of the butt end (Plate 3-4;a-b). None have an intact working or distal end. The two larger specimens appear to be basal sections of elk antler tine. Battering at their proximal ends has produced a smooth, regular facet, attesting to prolonged, heavy use.

Lacking working ends, these three specimens are unclassifiable, but their size suggest use as wedges. If so, it is interesting that these are the only fragments with complete proximal ends recovered at the site. By far the majority of antler specimens were fragments with working or distal ends. Because both specimens were found during bulldozer stripping operations, we can make no statement of provenience other than to suggest that they most probably were removed from the early Hudnut Phase or latter part of the Kartar Phase component.

Awls

Four separate varieties of awls were found: use-modified long bone splinters (Plate 3-6;a-j), split metapodial awls (Plate 3-6;k-n), whole metapodial awls (Plate 3-7;a), and a single ground rib fragment. Table 3-41 lists their condition and the nature of their manufacture; only one, a splinter, came from the Hudnut component (Table 3-42). All but one were made on bones from large game animals, including Cervus, Odocoileus, and possibly Ovis. The single exception is a splinter awl of bird long bone. Manufacture ranges from little or none on the splinter awls to uniform grinding of the shaft on the whole and split metapodial awls. These latter forms were made by splitting the metapodial longitudinally from the proximal end, grinding down the broken shaft to a smooth point and removing any irregularities on the shaft itself. Prolonged use created an oily sheen along the shaft well up to the articular end. All of the specimens, regardless of manufacture, exhibit this polish.

Table 3-41. Awl manufacture, 45-OK-11.

Material Treatment	Manufacture		Condition		Total
	Completely Ground	Partially Ground	Complete	Fragment	
Split metapodial	–	10	7	3	10
Whole metapodial	1	5	1	5	6
Rib	–	1	–	1	1
Splinter	–	4	3	1	4
Total	1	20	11	10	21

Table 3-42. Awl distribution, 45-OK-11.

Material Treatment	Hudnut Component	Kartar Component	Total
Split metapodial	–	10	10
Whole metapodial	–	6	6
Rib	–	1	1
Splinter	1	3	4
Total	1	20	21

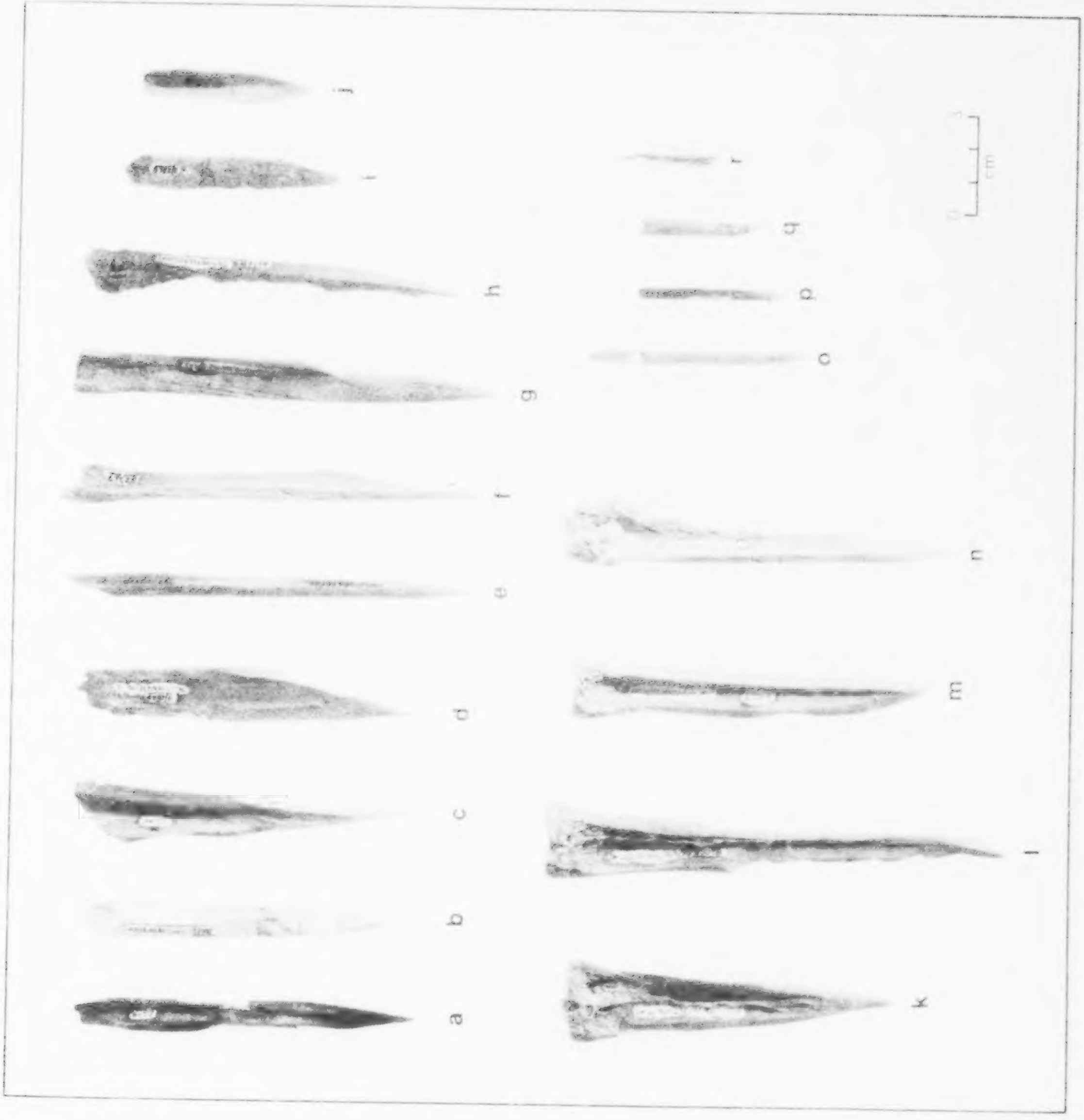
All four varieties are common elements of prehistoric Plateau assemblages. Nelson (1969), Leonhardy (1970), and Ames et al. (1982) illustrate a similar range of forms spanning at least the last 6000 years. No

KEY:
Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
2796	305	2166	2827	260	2317	933	2155	2318	2770
Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl	Splinter awl
4S75E/220	18N68E/200	113N74E/60	114N67E/90	113N67E/50	66N58E/130	33N64E/185/F181	115N77E/70/F9	66N58E/130	4S74E/120
12	24	72	82	82	12	45	72	12	12
Bone	Bone	Bone	Bone	Bone	Bone	Bone	Bone	Bone	Bone

k.	l.	m.	n.	o.	p.	q.	r.
831	2098	2364	2570	2636	2397	583	1685
Split metapodial awl	Split metapodial awl	Split metapodial awl	Split metapodial awl	Eyed needle	Eyed needle	Eyed needle	Eyed needle
76N63E/90/F100	117N74E/70/F3	55N52E/150	19N66E/180/F47	10N70E/170	31N53E/80	20N58E/190/F141	74N73E/100/F136
54	72	12	24	12	12	36	55
Bone	Bone	Bone	Bone	Bone	Bone	Bone	Bone

Plate 3-6. Splinter awls, split metapodial awls, and eyed needles, 45-OK-11.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KEY:
Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.
2216
Metapodial awl
113N77E/80
72
Bone

b.
1998
Matting needle
42N67E/185/F401
12
Bone

c.
1
Matting needle
113N73E/80
72
Bone

d.
1110
Metapodial awl
82N66E/140/F128
62
Bone

k.
2706
Flaked metapodial
113N73E/50
72
Bone

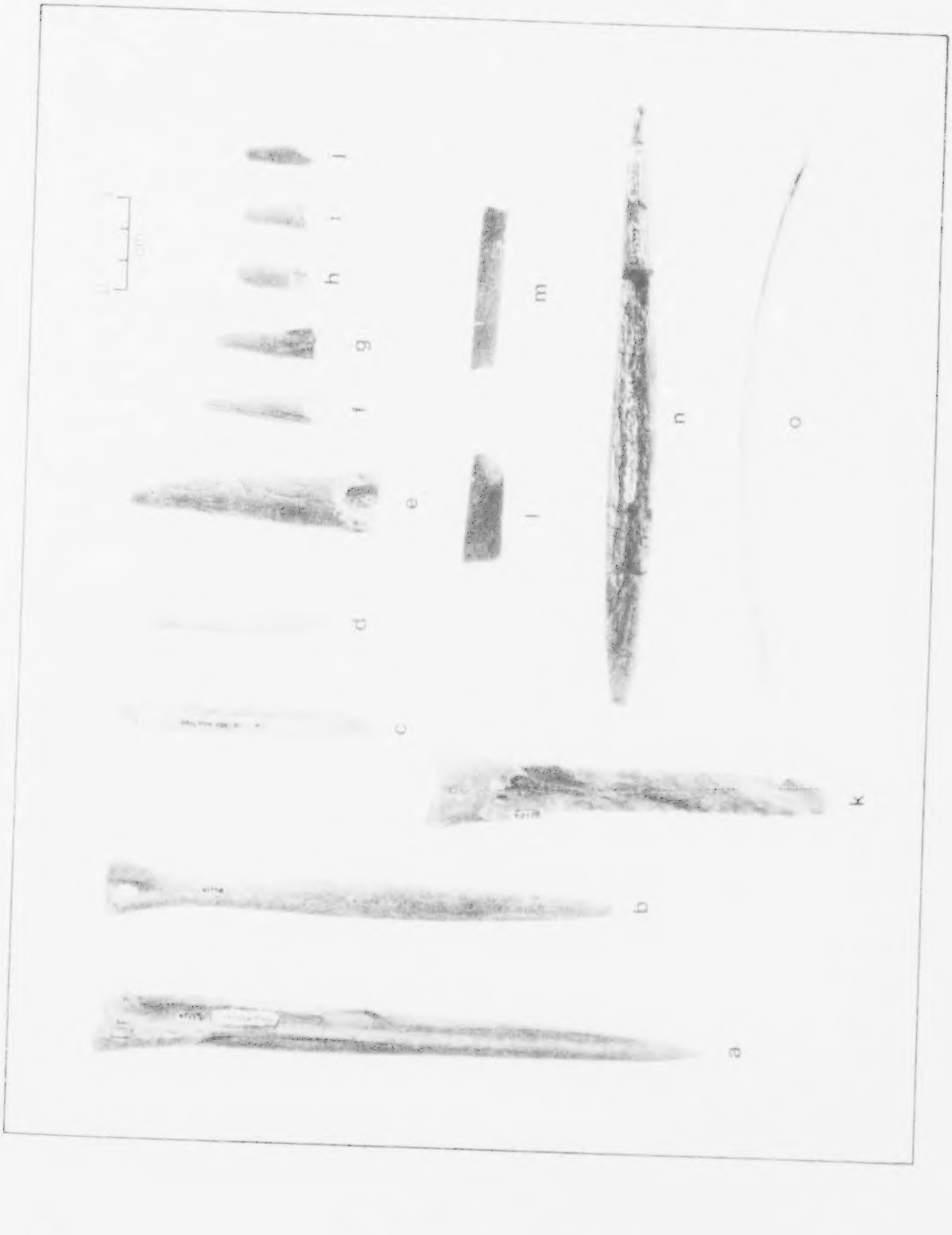
l.
2384
Shuttle
52N57E/40
11
Antler

m.
2712
Shuttle
113N73E/80
72
Bone

n.
1950
Shuttle
59N69E/90/F42,250
12
Antler

o.
331
Shuttle
23N66E/230/F159
24
Bone

Plate 3-7. Metapodial awls, matting needles, shuttles, and tine flakers, 45-OK-11. Items e. through j. are antler tine flakers.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single form is diagnostic of any specific temporal period or cultural phase, although the variety of awl forms and the carefully finished metapodial awls often are cited as evidence of a well-developed bone industry and held to be characteristic of the Cascade Phase (cf., Butler 1962; Bense 1972). This fits with the distribution of awls at this site, where all but one splinter awl were recovered from the Kartar Phase component dated at 5100-4200 B.P. We cannot, of course, conclude that this small sample supports the contention that earlier adaptations utilized a more well-developed industry, but this differential distribution does point to some difference in site use during the two components, and the awl assemblage may indeed characterize an earlier, more refined bone industry.

Needles

Three sewing needles with partially intact eyes and proximal ends were found. Two are made of long bone, and the other appears to be of antler. Two have been broken at the approximate midpoint of the shaft and through or across the eye. One specimen is complete, and shows pronounced dulling of the tip and polish extending up to the eye. Shafts have been uniformly ground, producing regular lenticular cross sections. Eyes were made by cutting a notch from both surfaces into the midsection, whereupon the hole was enlarged and rounded.

All three specimens were recovered from the Kartar Phase component. Table 3-43 lists the condition and provenience of bone needles, matting needles, and shuttles.

Table 3-43. Bone needles[1], 45-OK-11.

Master Number	Material	Zone	Condition
2636	Bone	12	Whole
583	Bone	36	Proximal fragment
1683	Bone	61	Proximal fragment
2780	Bone	12	Distal fragment
2397	Bone	12	Proximal fragment
1251	Bone	61	Proximal fragment

[1] These counts include only those artifacts positively classified as needles or needle fragments; numerous ground shaft fragments identified only as PBF, TMD, or BTR are not included.

Matting Needles

Two matting needles were recovered (Table 3-44). Both are highly polished long bones, formed by grinding, and have holes carved into natural concavities located just below the proximal articular ends (Plate 3-7). Distinct from awls or sewing needles because of their broad, flattened cross section and blunt tapered tips, they are assumed to have been used in lacing matting materials. Ray (1932) describes similar forms used for this purpose.

Table 3-44. Matting needles, 45-OK-11.

Master Number	Material	Zone	Condition
1998	Deer-sized long bone	12	Complete
1	Deer-sized long bone	72	Complete

The larger of the two has a series of small, slanted lines cut along one lateral margin beginning just below the expanding proximal end and extending down to the approximate midpoint of the specimen. The other is undecorated. Both show light wear and some polish along the length of the shaft from the tip.

Both specimens were recovered from the Kartar Phase component. Nelson (1969), Leonhardy and Rice (1970), Bense (1972), and Ames et al. (1980) illustrate similar specimens spanning the last 8,000 years.

Shuttles

Five shuttles were recovered (Table 3-45). Four are ground, polished rib segments. The fifth is a carefully ground, elongate sliver of antler. Three of the rib fragments are problematic assignments, termed shuttles because of their flat cross section, high polish, and blunt, rounded tip. One rib shuttle is complete, and retains the original curvature of the rib; although its surface is badly eroded, its tip shows heavy intense grinding. The antler shuttle is complete except for one missing tip. The surface is uniformly ground, exhibiting close parallel striations running in long facets along the upper and lower lateral margins.

We base our classification of these artifacts as shuttles on the description of similar forms by Ray (1932). All of the identified shuttles and shuttle fragments are from the Kartar Phase component. We have not located comparable prehistoric examples in published archaeological reports on the Columbia Plateau.

Table 3-45. Shuttles, 45-OK-11.

Master Number	Material	Zone	Condition
331	Deer-sized rib	24	Complete
1950	Antler	12	Complete
2384	Antler	11	End fragment
2712	Deer-sized rib	72	Fragment
890	Indeterminate	54	Fragment

Bevelled Points

Nine bifacially bevelled points were recovered (Plate 3-8). Eight are made of antler and one is bone. The antler points are broad and thick at the tip, tapering to a long, thin socket at the proximal end. The single bone point is smaller and more delicate, with an elongate tip and less bevelled proximal end. Table 3-46 lists the dimensions of these points and records their distribution by area zone.

Table 3-46. Bevelled bone points, 45-OK-11.

Master Number	Material	Length (cm)	Width (cm)	Point Thickness (cm)	Haft Thickness (cm)
2682	Antler	5.3	1.2	0.6	0.3
1316	Antler	5.1	1.1	0.4	0.4
998	Antler	5.2	1.0	0.5	0.4
298	Antler	4.1	0.8	0.4	0.3
15	Antler	3.9*	0.8	0.7	0.4*
1957	Antler	4.8	0.7	0.3	0.3
769	Antler	3.9	1.0	0.4	0.4
2030	Antler	5.2	1.1	0.6	0.4
700	Bone	4.3	0.6	0.3	0.3
		$\bar{x}$=4.6	$\bar{x}$=0.9	$\bar{x}$=0.46	$\bar{x}$=0.35

*Incomplete specimen.

Seven of the nine points were recovered from the Kartar Phase component, and two were unassigned, either recovered in testing or from wall slump. Comparable bevelled points appear to be characteristic of prehistoric economies over the last 10,000 years (cf., Butler 1962; Swanson 1962; Nelson 1969). Authors differ in their interpretation of these artifacts. Some suggest that they are projectile points, while most refer to them simply as bone points and, refuse to speculate on their use. Their form is similar to objects described as composite harpoon points (Stewart 1977); the presence of valves, leisters, and barbed harpoon points in the site assemblage makes this a plausible interpretation.

Slender Points or Barbs

Our identification of these specimens is uncertain, given both the form of the specimens recovered and points and barbs described by Stewart (1977). Commonly, points on leister spears and barbs were little more than sharpened splinters of bone or antler. All specimens classified here as points or barbs are sharpened bone splinters, and were recovered from the Kartar component (Plate 3-8;a-g). Table 3-47 lists measurements and provenience information. Most are uniformly ground to form long, slender points, although manufacture is usually not complete. These forms differ from awls or needles in having a rougher, less finished appearance, variable cross section, and no evidence of smoothing or polishing. Stewart (1977) shows similar points on leister spears, and on a broad assortment of bent wood, straight, and v-hooks used in fishing.

Table 3-47. Slender bone points or barbs, 45-OK-11.

Master Number	Material	Length (cm)	Thickness (cm)
1902	Bone	3.5[1]	0.3
2472	Bone	3.3[1]	0.3
1975	Bone	4.0[1]	0.4
2290	Bone	2.0[1]	0.3
1984	Bone	2.0[1]	0.3
2377	Antler	2.4[1]	0.5
1823	Bone	4.9[1]	0.7
881	Bone	3.5[1]	0.4
			$\bar{x}$=0.4

[1] These measurements indicate an incomplete specimen.

Comparable prehistoric examples appear in Cressman (1960) and Collier et al. (1942). These are not diagnostic of any period or cultural phase, although they seem more numerous in later prehistoric assemblages in the period 2000-200 B.P. (cf., Browman and Munsell 1969; Leonhardy and Rice 1970).

Large, Unbevelled Points

These are large, thick antler points with ground, slender tips and rounded butt ends (Plate 3-8;h-k). Two specimens were recovered from the Kartar component, the other from Analytic Zone 53 which is transitional

KEY: Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.
1975
Barb
44N63E/170/F401
12
Bone

b.
2377
Barb
44N62E
12
Bone

c.
1984
Barb
43N63E/110/F400
12
Bone

d.
2472
Barb
22N66E/220
24
Bone

e.
881
Barb
35N65E/175/F181
45
Bone

f.
1902
Barb
74N76E/100/F150
54
Bone

g.
2260
Barb
106N72E/100
82
Bone

h.
1274
Unbeveled point
81N69E/80/F100
53
Antler

i.
1210
Unbeveled point
76N68E/100/F100
53
Antler

j.
1135
Unbeveled point
71N69E/70/F100,103
54
Antler

k.
1219
Unbeveled point
76N68E/135/F31
61
Antler

l.
1957
Bifacially beveled point
70N63E
1
Antler

m.
2692
Bifacially beveled point
1962E/90
11
Antler

n.
2030
Bifacially beveled point
42N72E/25/F23,500
12
Antler

o.
298
Bifacially beveled point
18N63E/190/F155
24
Antler

p.
700
Bifacially beveled point
18N58E/50/F110
32
Antler

q.
998
Bifacially beveled point
32N65E/160/F180
45
Antler

r.
768
Bifacially beveled point
84N61E/80
54
Antler

s.
1316
Bifacially beveled point
73N70E/90/F103,104
61
Antler

t.
632
Harpoon point blank
32N63E/30/F800
42
Bone

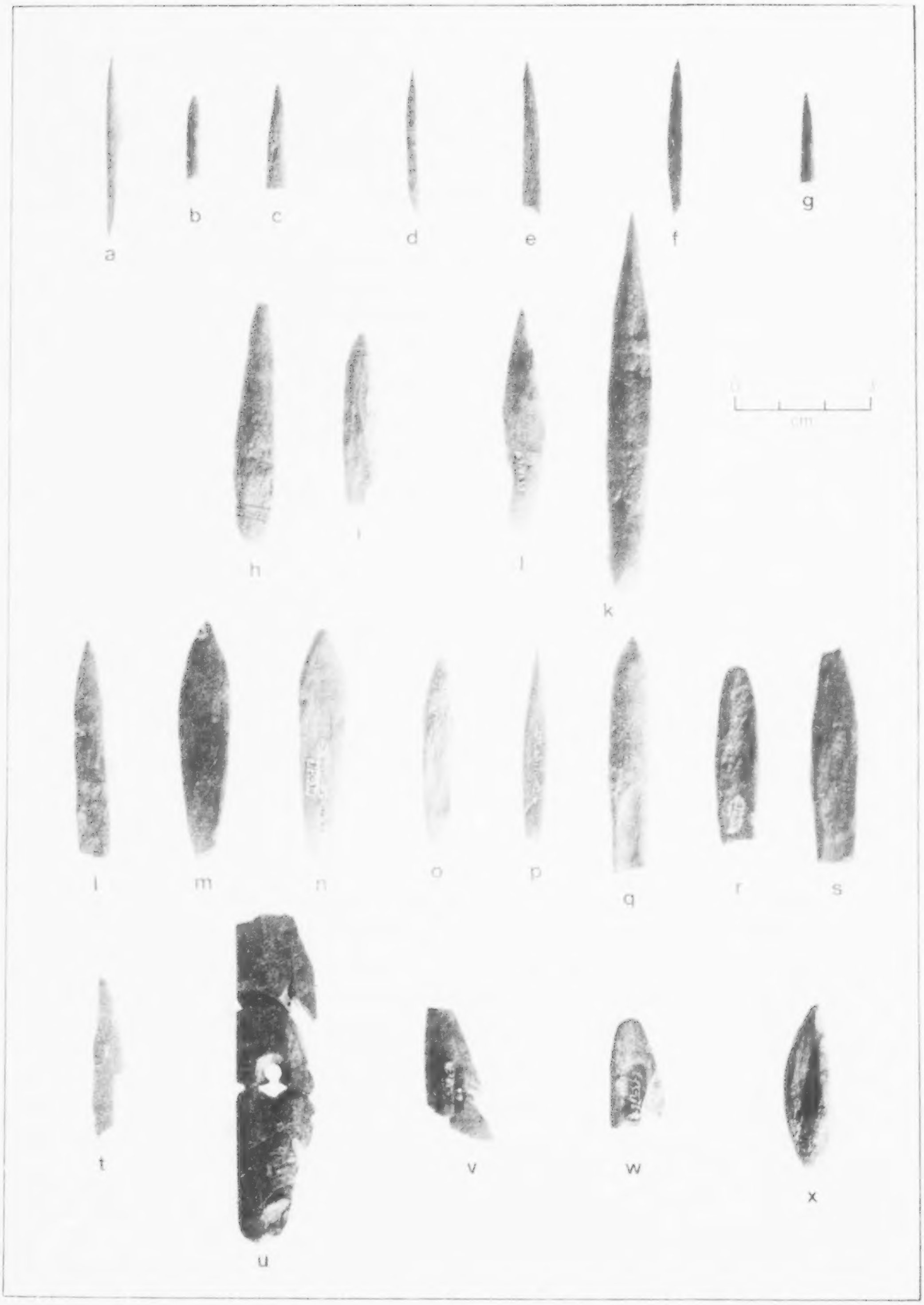
u.
1208
Harpoon point
76N68E/60,100/F100
52/53
Bone

v.
1030
Harpoon point
73N67E/60
52
Antler

w.
1545
Harpoon point
71N72E/90
54
Antler

x.
1001
Harpoon valve
32N65E/185/F185
46
Bone

Plate 3-8. Bone and antler fishing equipment, 45-OK-11.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between the Kartar component and the Hudnut component in the Housepit 1 block. Table 3-48 lists their measurements. All three points have crude notches carved in one or more sides, probably to facilitate hafting. These artifacts appear to have been roughed out through carving, and then ground part way up from the tip. They may have been used in large composite spears, but we lack ethnographic examples. Similar forms usually are classified simply as bone points (Cressman 1960; Nelson 1969), and appear to be distributed over the last 8,000 years.

Table 3-48. Unbevelled bone points, 45-OK-11.

Master Number	Material	Length (cm)	Thickness (cm)
1219	Antler	8.4	1.0
1274	Antler	5.7	0.9
1135	Antler	5.0	0.9
		$\bar{x}$=6.4	$\bar{x}$=0.93

Barbed Harpoon Points

Four fragmented barbed harpoon points were recovered (Plate 3-8;t-w). Three were from the Hudnut component, the fourth from the Kartar component (Table 3-49). Three are badly broken remnants of tips, and one is a section of a point retaining two barbs and the central hole below the rounded butt where the point was attached with line to the spear shaft. All four are likely of antler and all show evidence of at least one barb or shoulder. Barbs were formed by sawing into the antler blank, probably with an abrasive plant fiber, or, in one instance, cutting with a stone tool. The intact lashing hole was created by biconical drilling. Surfaces were uniformly ground and polished.

Table 3-49. Barbed harpoon points, 45-OK-11.

Master Number	Material	Description
1545	Antler	Possible harpoon point with distal barb
632	Antler	Possible harpoon point in production
1030	Antler	Fragmented harpoon point with distal barb
1208	Antler	Harpoon point drilled for line attachment

The large, relatively intact specimen exhibits fine, parallel regular striations on its surface, which may indicate use of a plant fiber in polishing. Its overall length would probably have exceeded 10 cm, with a width of 1.8 cm, and a maximum thickness of 0.8 cm. One surface and both lateral margins have been completely ground and polished. The opposite surface has been left unfinished, showing the vascular structure of the antler. On its single polished surface, a series of short lines have been cut along the edge opposite the barbs down from the butt to below the lashing hole, as well as an irregular X or V just above the lashing hole. These markings may have been made by the owner to identify the harpoon point. Similar specimens from prehistoric contexts have been described by Collier et al.(1942) and Cressman (1960).

Harpoon Valve

One leaf-shaped harpoon valve made of antler was recovered from the lowest subzone of the Kartar Phase component in excavation Area 4 (Plate 3-8;x). One surface has a ground concavity extending up from the tip to just below the butt or rounded end. The opposite surface is also ground but is irregular in cross section and slightly domed. We base our identification as a valve on illustration by Stewart (1977) based on ethnohistoric information, and illustrations of prehistoric specimens by Cressman (1960) and Nelson (1969).

Antler Tine Flakers

Three of seven antler tines show attrition on unifacially bevelled tips characteristic of tine flakers (Plate 3-7;e-j). All three are badly eroded tip sections not more than 2.5 cm in length. One terminates in a natural break, the other two have numerous cut marks where they were intentionally detached from a larger tine section. The cut marks may also have served as a hafting notch. One was recovered from the lower fill of upper Housepit 1 (Feature 100), one from the lower fill of lower Housepit 1 (Feature 104), and the other from the floor of upper Housepit 1 (Feature 31). Nelson (1969) illustrates a number of comparable specimens assigned to the Cayuse Phase (ca. 2000-200 B.P.).

Bone Ornaments

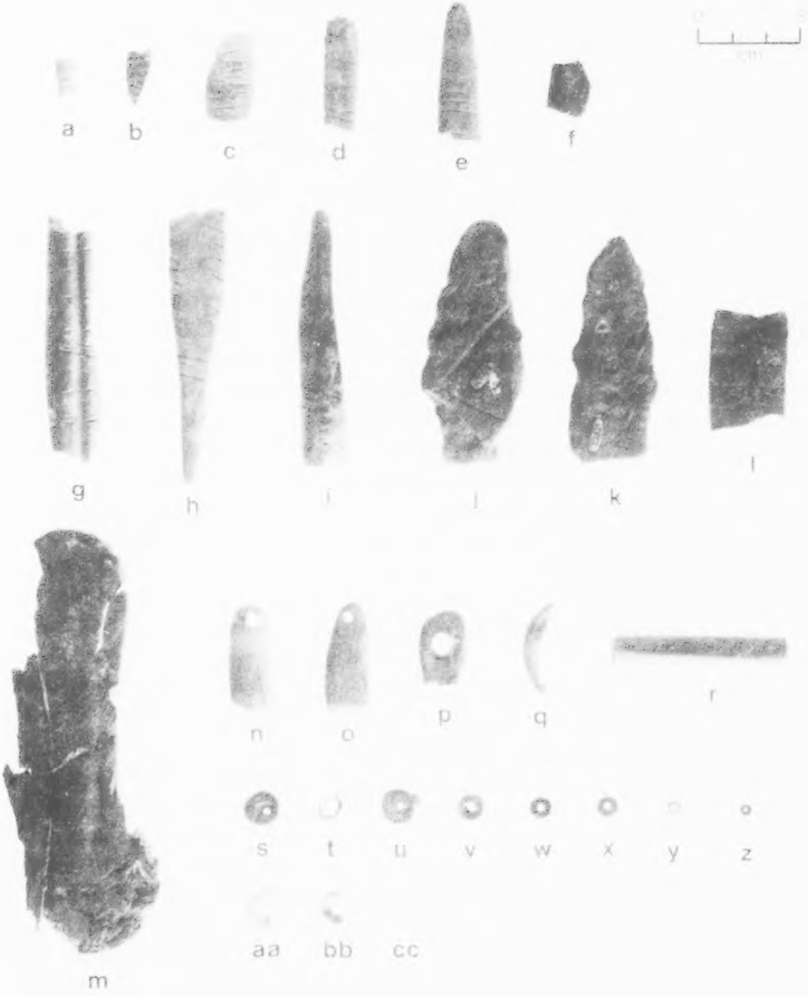
Two elongate, rectilinear bone pendants were recovered from the Kartar Phase component (Plate 3-9;n-o). Both have a biconically drilled hole in one laterally constricted end. They were manufactured by scoring or cutting a section of long bone, and grinding the margins to the desired shape. The first example (Plate 3-9;n), although smoothed and polished on both surfaces and the four margins, lacks any decoration. The other (Plate 3-9;0), also uniformly smoothed and polished, has two closely spaced, parallel lines near the wide terminal margin opposite the drilled hole. In both instances, the tool maker did not attempt to finish the distal end, although the second is more finely finished than the last.

One large tubular bead of bird bone was recovered (Plate 3-9;r). The tool maker detached it by scoring the parent bone completely around its circumference of the ends and then snapping off the section. It retains the jagged points of detachment at either end. The surface has been smoothed through abrasion and then polished.

KEY:
Master Number:
Object Type:
Provenience/Level:
Zone:
Material:

	Master Number	Object Type	Provenience/Level	Zone	Material
a.	2703	Incised bone	114N73E/90	72	Bone
b.	1794	Incised bone	80N73E/120/F6	65	Bone
c.	2176	Incised bone	116N75E/80	72	Bone
d.	2385	Incised bone	53N57E/60	12	Bone
e.	1820	Incised bone	74N75E/90/F90	54	Bone
f.	508	Drilled bone	32N60E	34	Bone
g.	2041	Incised bone	14N62E/90	11	Bone
h.	660	Incised bone	33N62E/110	43	Bone
i.	2058	Polished bone	13N62E/170/F12	12	Bone
j.	2234	Incised siltstone	36N60E/40	42	Siltstone
k.	2233	Incised siltstone	36N60E/40	42	Siltstone
l.	81	Incised siltstone	64S57E/10	11	Siltstone
m.	1151	Incised bone	78N66E/145/F31	61	Bone
n.	345	Bone pendant	24N69E/200/F170	24	Bone
o.	2412	Bone pendant	31N54E/100	12	Bone
p.	528	Incised bone	32N60E/140/F200	44	Bone
r.	2101	Bead	117N75E/70/F3	72	Bone
s.	917	Bead	34N64E/40	42	Slate
t.	1708	Bead	76N70E/130	61	Slate
u.	717	Bead	18N59E/120/F117	34	Indeterminate
v.	1304	Bead	71N71E/20	51	Serpentine
w.	1303	Bead	71N70E/50	52	Slate
x.	2664	Bead	25S70E/90	12	Slate
y.	857	Bead	79N62E/30	51	Slate
z.	2656	Bead	30S79E/60	11	Slate
aa.	1525	Bead	79N70E/135/F31	61	Shell
bb.	2132	Bead	3N61E/150	12	Shell
cc.	1813	Bead	79N73E/140/F6	65	Shell

Plate 3-9. Decorated bone and siltstone, bone, stone, and shell ornaments, 45-OK-11. Item q. is a tooth, probably natural.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Decorated Bone

Eight specimens are decorated with patterns of incised lines, usually consisting of parallel lines cut across the surface perpendicular to the long axis of the form (Plate 3-9;a-h). The regular pattern of these lines suggest they were ornamentation or elements of personel identification rather than butchering marks. Few appear to be complete, with most being remnants of larger objects, perhaps pieces of utilitarian items like awls or shuttles.

One (Plate 3-9;a) is a small polished linear fragment of a larger artifact, perhaps the remnant of a hairpin or shuttle. The surfaces and margins have been smoothed through abrasion. Three deep, parallel lines have been carefully cut into one surface. Their symmetry and smooth walls indicate they were incised by plant fiber rather than a stone tool.

Another is a small, badly charred fragment with one polished surface covered with parallel to overlapping incisions (Plate 3-9;b). One surface has been abraded and haphazardly cut or incised.

Plate 3-9;c is a carved, rectilinear section of long bone. One surface has been partially abraded. A series of parallel and crisscrossing lines have been cut into the prepared surface with little attempt at symmetry. This may be an unfinished gaming piece or a trial blank of unknown function.

Another incised bone object (Plate 3-9;d) is the polished end of a large shuttle, gaming piece, or ornament. Abrasion has smoothed surfaces and margins. One surface exhibits four parallel incised lines, three of which are tightly clustered. Both lateral margins have been incised with short lines arranged in clusters of two and three. Gouge marks, asymmetry, and miss cuts within the lines suggest use of a stone graver.

A larger polished fragment, is also perhaps from a gaming piece (Plate 3-9;e). Abrasion has smoothed the surfaces, but the margins show evidence of some shaping by carving. A milky luster may indicate prolonged handling or the use of oil or fat to polish it. Deep gouges, striations and asymmetry in the development of the lines evidence use of a stone graver. Lines of varying width and length decorate both surfaces and lateral margins.

Plate 3-9;f shows a small, flattened section of highly polished, charred bone, decorated with a series of small dots on one surface. Both surfaces and the one intact margin have been abraded. The dots appear to have been made with a stone drill, given the presence of discontinous striae in the holes. The pits uniformly reveal a deep striae near the surface, and this, coupled with consistent depth, makes it likely that the same stone drill was used to make all twelve dots. The specimen was charred before the dots were drilled. Its rich luster suggests polishing with grease or oil.

On a split long bone fragment, partially smoothed along one lateral margin, clusters of parallel lines and deep notches have been cut along the length of one surface (Plate 3-9;g). The original form is problematic, but overall configuration and smoothing along intact lateral margins may indicate use as an awl or shuttle.

The object shown in Plate 3-9;h is a large fragment of the end of a hairpin or shuttle. Abrasion has uniformly smoothed surfaces and margins. The evenness of the striations suggests the use of a plant fiber rather than stone. Incisions extend from the lateral margins up onto both surfaces at angles oblique to the midline of the specimen. Lines appear to have been cut with a stone tool. The deep luster of the specimen indicates polishing with grease or oil.

Shown for contrast is a badly fragmented section of large long bone (Plate 3-9;m). Numerous incisions criss-cross one surface. They are shallow and haphazard in pattern indicating they are incidental incisions due to butchering, rather than deliberate decoration.

BEADS

Eight stone beads were recovered: two from the Kartar Phase component and six from the Hudnut Phase component (Plate 3-9). Six are made of slate, one is serpentine, and another is limestone. All but one have central, biconically drilled holes. The exception has a natural hole, and appears to have been ground only around the exterior.

Two of the beads appear to be unfinished blanks. On one, the circular edge has yet to be ground; a small protruberance at one point has not been removed. On the other specimen, the circular margin has been ground, but it is not so uniform as that of the nicely finished forms. Grinding has created bevelled facets around the bead's circumference. This may indicate that it was held in the hand and ground rather than strung on a stick or roller along with other beads and ground with them.

Similar beads have been found at other sites in the project area (Lohse 1984b; Jaehnig 1984a; Campbell 1984b), and span the 6,000 year range of occupation.

Three shell beads were found (Plate 3-9;aa-cc). Two are disc beads, probably made from the local river mussel. The other is a spire section Olivella shell. One disc bead has a hole drilled through from one side. The other is biconically drilled. Both disc beads are fragments, broken through the approximate centers.

All three shell beads were recovered from the Kartar Phase component; one from the floor of Upper Housepit 1, one from the wall of Lower Housepit 1, and one from the general midden of Zone 2, excavation Area 1. All three are characteristic of the Cascade Phase and later cultural phases (cf., Nelson 1969; Bense 1972). The presence of Olivella indicates trade with the coast, and its placement in the Kartar Phase component may support the suggestion by Nelson (1969, 1973) and others that there was direct trade with the coast before 3000 B.P.

SUMMARY OF DIAGNOSTIC PATTERNS AT 45-OK-11

The two component assemblages at this site are clearly marked by distinctive artifact types, whose temporal distribution correlates with shifts in techniques of manufacture and patterns of tool use discussed in the preceding sections. The most sensitive temporal indicators are projectile point types. These denote changes within the Kartar Phase component as well as between the Kartar Phase and Hudnut Phase components. Cobble tools and bone implements are diagnostic as assemblages, highlighting differences between the two components. However, the constituent tool types do not have distributions confined to one component or the other, perhaps indicating that they were not subject to the variable stylistic changes noted for projectile points, or, at least, that changes in these forms were not rapid enough to be discernible in cultural occupations spanning less than 1,200 years. Certainly, there were changes in these tool assemblages during the transition from the defined Cascade Phase to Tucannon or Frenchman Springs Phases (cf., Leonhardy and Rice 1970; Nelson 1969, 1973). Different projectile point forms in the Kartar Phase component may indicate that this period at 45-OK-11 was transitional, a time when elements characteristic of the Kartar Phase were being replaced by those more characteristic of the Hudnut Phase. That this earliest component is still classifiable as Cascade-like is shown in the number of diagnostics dated to the period from ca. 5400-4200 B.P., and the clear distinction between this assemblage and the subsequent Hudnut Phase assemblage.

Projectile point types from the Kartar Phase component show more diversity and a somewhat different stratigraphic distribution than we might have expected. At least six separate types are represented in the Kartar Phase. Their temporal arrangement suggests that type sequences defined for the southern and middle Columbia Plateau may be in adequate for interpretation of cultural chronology on the Upper Columbia River. Diagnostic Cascade types and the Cold Spring Side-notched type are present, but others like the Mahkin Shouldered type and possible Cascade B and Windust B specimens are noteworthy additions. Concave-based lanceolate (Specimens #1019, #2508) and notched-stem, shouldered lanceolate (#1937) projectile points, which resemble early Cascade B and Windust B types, were found in the earliest strata of the Kartar Phase component. Although the Cascade B and Windust B types are dated at or before 8000 B.P. in the Snake River region (cf., Rice 1969, 1972; Leonhardy and Rice 1970), associated radiocarbon dates here spanning a range from ca. 5400-5000 B.P. indicate that these points were in use at a much later time along this stretch of the Columbia River. Further, the specimens from 45-OK-11 were found in stratigraphic contexts with Cold Spring Side-notched and Mahkin Shouldered lanceolate points which are diagnostic of the later part of the Kartar Phase in the Rufus Woods Lake project area. Characteristic Cascade A and B types are found in association with these other types but their highest frequencies occur stratigraphically higher in the site (e.g., lower fill of Housepit 1, dated some time after ca. 4700 B.P.) (Table 3-28).

Thus, at 45-OK-11, diagnostic Cascade types occur in the latter part of the Kartar Phase component, preceded by shouldered lanceolate and large side-notched points. The presence of the Mahkin Shouldered lanceolate type in the earlier occupations, capped by characteristic Cascade types, is unique to this site. Indeed the classic Cascade points associated with Mazama Ash at site 45-DO-273 supply the earliest dated occupation in the project area (Jaehnig 1984a). Adding to this diversity of forms is the occurrence of two large, stemmed triangular points from house floors dated at or slightly before 4700 B.P. (M#2000, M#651). These points do not represent well-defined types on the Plateau, though they most closely resemble the Columbia Corner-notched type which has a comparable antiquity in the Snake River region (cf., Leonhardy and Rice 1970). Thus, the stratigraphic distribution of projectile point types at 45-OK-11 reveals greater diversity in the number of types characteristic of a Cascade-like artifact assemblage than documented elsewhere on the Columbia Plateau, and it firmly places the Mahkin Shouldered type and the unnamed, stemmed triangular specimens as contemporaneous with characteristic Cascade types.

We have contrasted the cobble tool assemblages of the Kartar Phase and Hudnut Phase components. A greater investment of time and effort manifested in the large number and diversity of tools in the lower component permits us to speak of a "cobble tool industry" which served many discrete economic functions. In contrast, the Hudnut Phase component exhibits similar forms but less formal variety and far less intensive use. The Kartar Phase component cobble tools share many of the characteristics of Cascade Phase site assemblages in the lower Snake River region. The classic edge-ground cobble is lacking, however, if we assume that these must be elongate flat stones with bevelled facets trailing the thin lateral margins (cf., Crabtree and Swanson 1968; Leonhardy and Rice 1970; Simms 1971; Bense 1972). It has, instead, many cobble forms with complex overlapping patterns of wear--forms exhibiting ground and battered facets over and across chipped edges, pecked and ground surfaces, and battered ends and surfaces. These represent a continuum of functional tools represented by the traditional labels choppers, hammers, and edge-ground cobbles. This complex pattern which shows many more kinds of wear and a much higher intensity of use, distinguishes the Kartar Phase assemblage from the Hudnut Phase assemblage. This generalized pattern of tool use, rather than any specific tool form, allies the assemblage to those described as characteristic of the Cascade Phase elsewhere on the Columbia Plateau (cf., Leonhardy and Rice 1970; Greengo 1982).

It is difficult to determine if changes in the bone tool industry at this site are stylistically diagnostic. Methods of bone reduction and tool creation appear to have been similar in both cultural components. The major difference is the far greater number and range of tool forms in the Kartar Phase. However, this may be because of the greater amount of raw material available in the larger bone assemblage in the Kartar Phase component, which may in turn result from the more intensive butchering and meat processing activity in that period. Any inferred contrast between Kartar and Hudnut Phase assemblages must take into account the demonstrated shift in site use.

In general, very little detailed research has been done on bone tool assemblages on the Plateau. It is known that splinter awls, split metapodial awls, and various large and small needles are found throughout cultural phases spanning the last ten thousand years (cf., Leonhardy and Rice 1970; Browman and Munsell 1969; Nelson 1969). Thus, their occurrence in the Kartar Phase component at 45-OK-11 comes as no surprise. Bone implements of particular interest include numerous antler and horn wedges, possible fishing elements, and hundreds of small, charred polished sections of bone, probably needle or awl shafts. Wedges, although not necessarily assumed diagnostic, are more characteristic of post-Cascade Phase assemblages on the Snake River (Leonhardy and Rice 1970). Items of fishing tool kits are much more common in assemblages from later periods, and appear to occur in the highest numbers in the Harder and Cayuse Phases from ca. 1000-0 B.P. (Leonhardy and Rice 1970; Nelson 1969). That fishing equipment was also used in the earliest periods has been demonstrated at the Dalles (Cressman et al. 1960). The presence of wedges and fishing gear in the Kartar Phase component at 45-OK-11 adds to the list of diagnostic traits defined for pre-4000 B.P. assemblages (although a wedge was found in the Windust component at Marmes, Rice 1972:123). At least, we can conclude that wedges and fishing equipment are associated with diagnostic Cascade Phase artifacts, and that these elements became part of the general tool kit sometime prior to 5000-4000 B.P. in this area of the upper Columbia River.

Another probable early diagnostic is the large number of small, fragmented, highly polished bone shafts, reminiscent of specimens found in assemblages assigned to the Windust and Cascade Phases (cf., Leonhardy and Rice 1970; Rice 1972:123). Their original form or use is unknown, but their presence in this Kartar Phase component, associated with a large bone tool assemblage including various needle and awl forms, and evidence of extensive butchering and meat processing activities, indicate probable use in hide-working operations, perhaps as fine needles or awls. The large number of these specimens is diagnostic of the Kartar Phase bone tool assemblage in the Rufus Woods Lake project area. The other bone implements are common throughout the last 5,000 years in the project area, and are important only in that they establish the presence of a range of similar tools characteristic of a well-developed bone industry in the period from about 5,400-4,200 years ago. Their occurrence with diagnostic Cascade Phase artifacts suggest that current views concerning the nature of this early tool kit be revised. Particularly important is the presence of wedges and other wood-working tools, and elements of a fishing tool kit very like that documented over the last 1,000 years of Plateau prehistory and described for ethnographic groups.

Another important Cascade trait, a preponderance of large, well-made lanceolate and triangular knives, is represented at 45-OK-11 by a number of large biface fragments recovered from both the Kartar Phase and Hudnut Phase components (Plate 3-10). These are percussion flaked, often in a fine, even collateral pattern, but the lack of complete or even nearly complete specimens precludes determination of the original outline. Their tips are quite broad, and suggest an oval or lanceolate shape. These are very similar to diagnostic specimens illustrated by Leonhardy and Rice (1970), but they are not definitive. Nor do they occur in the high numbers we presume to be a prerequisite for assignment as a Cascade diagnostic.

Another characteristic described for Cascade Phase tool assemblages are tabular and keeled endscrapers. These are present in the Kartar Phase assemblage (Plate 3-11). More common than the large biface fragments, they still do not comprise a large percentage of the scraping tools recovered. Again, if presence alone is diagnostic, we have another defined Cascade trait. However, they do not occur to the exclusion of other scraper forms.

In sum, the Kartar Phase tool assemblage has the following diagnostic elements:

a) Cascade projectile point types

b) Cold Springs Side-notched type

c) Mahkin Shouldered Lanceolate type

d) a varied tool industry which includes edge-ground cobbles, hammers, pestles, mortars, hopper mortar bases, and hammerstones

e) an extensive bone tool industry, including possible fishing equipment, wedges, and enigmatic, fragmented sections of polished bone shaft

f) a diverse flake tool assemblage, including large, bifacially flaked knves, tabular and keeled end scrapers, and various other tool forms made on flakes and blades

To this list should be added occurrences of large, stemmed triangular points, Nespelem Bar type and Columbia Corner-notched type points. These projectile point types, more indicative of the subsequent Hudnut Phase, suggest that the Kartar Phase component may represent a transitional period at ca. 5400-4200 B.P. wherein earlier and later diagnostic elements are mixed. Further, the related aspects of the Kartar Phase and Hudnut Phase assemblages indicate a cultural transition quite unlike the abrupt replacement postulated by Leonhardy and Rice (1970) and others (e.g., Rice 1974; Ames and Marshall 1984; Ames et al. 1981). Generally comparable methods of tool production and patterns of tool use indicate very similar activities in both components focused on comparable sets of resources. This is true despite a marked shift in site use.

What is most intriguing perhaps is that a very short period of time, which our radiocarbon dates indicate as 200-400 years, separated occupations in the two cultural components. In that interval, certain diagnostic traits disappeared, including use of Cascade and Cold Spring Side-notched projectile point types and Levallois-like blade production. However, other traits such as use of the Mahkin Shouldered Lanceolate, Nespelem Bar, and Columbia Corner-notched projectile point types continued into the subsequent Hudnut Phase component. Sometime after 4000 B.P., these types are joined by the hallmark of the Frenchman Springs Phase, the Rabbit Island Stemmed projectile point (cf., Swanson 1962; Nelson 1969). This tends to support Brauners' (1976) postulate that the Cascade Phase and later cultural phases are historically linked. A marked continuity in the overall adaptive pattern as found in sites with similar configuration and function in all three cultural phases identified for the Rufus Woods Lake strongly suggests that recognized cultural traits do not signal dramatic shifts in prehistoric adaptive strategy or economic organization. This point will be explored in the following chapters

KEY
Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.
2062
Biface
13N63E/40
11
Jasper

b.
2537
Biface
19N55E/50
32
Jasper

c.
2708
Biface
113N73E/20
71
Jasper

d.
2091
Biface
118N75E/40
71
Jasper

e.
1270
Biface
81N68E/50
52
Fine-grained basalt

f.
1493
Biface
80N70E/100/F100
53
Jasper

g.
1265
Biface
82N69E/100/F100
53
Fine-grained basalt

h.
2347
Biface
62N73E/90
12
Jasper

i.
2593
Biface
7N56E/130
12
Jasper

j.
2034
Biface
42N72E/150
12
Jasper

k.
2598
Biface
7N57E/130
12
Jasper

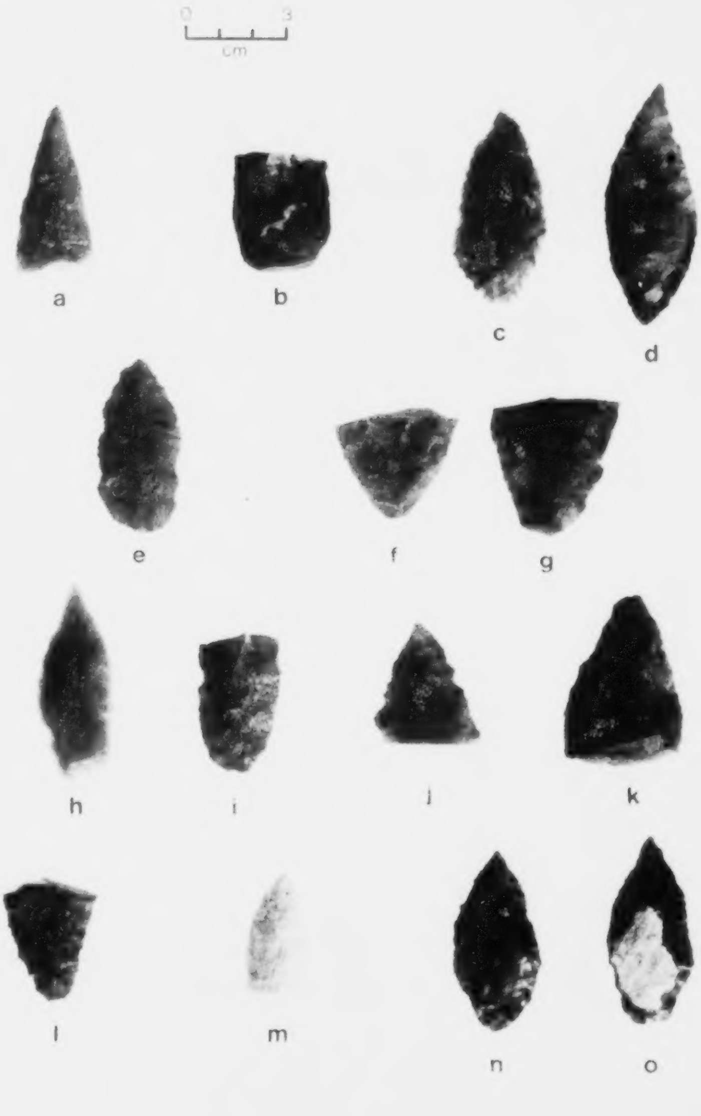
l.
2267
Biface
35N61E/140/F200
44
Jasper

m.
1141
Biface
83N66E/175/F101
65
Fine-grained quartzite

n.
2159
Biface
114N74E/100
72
Jasper

o.
2141
Biface
116N77E/80
72
Jasper

Plate 3-10. Large bifaces, 45-OK-11.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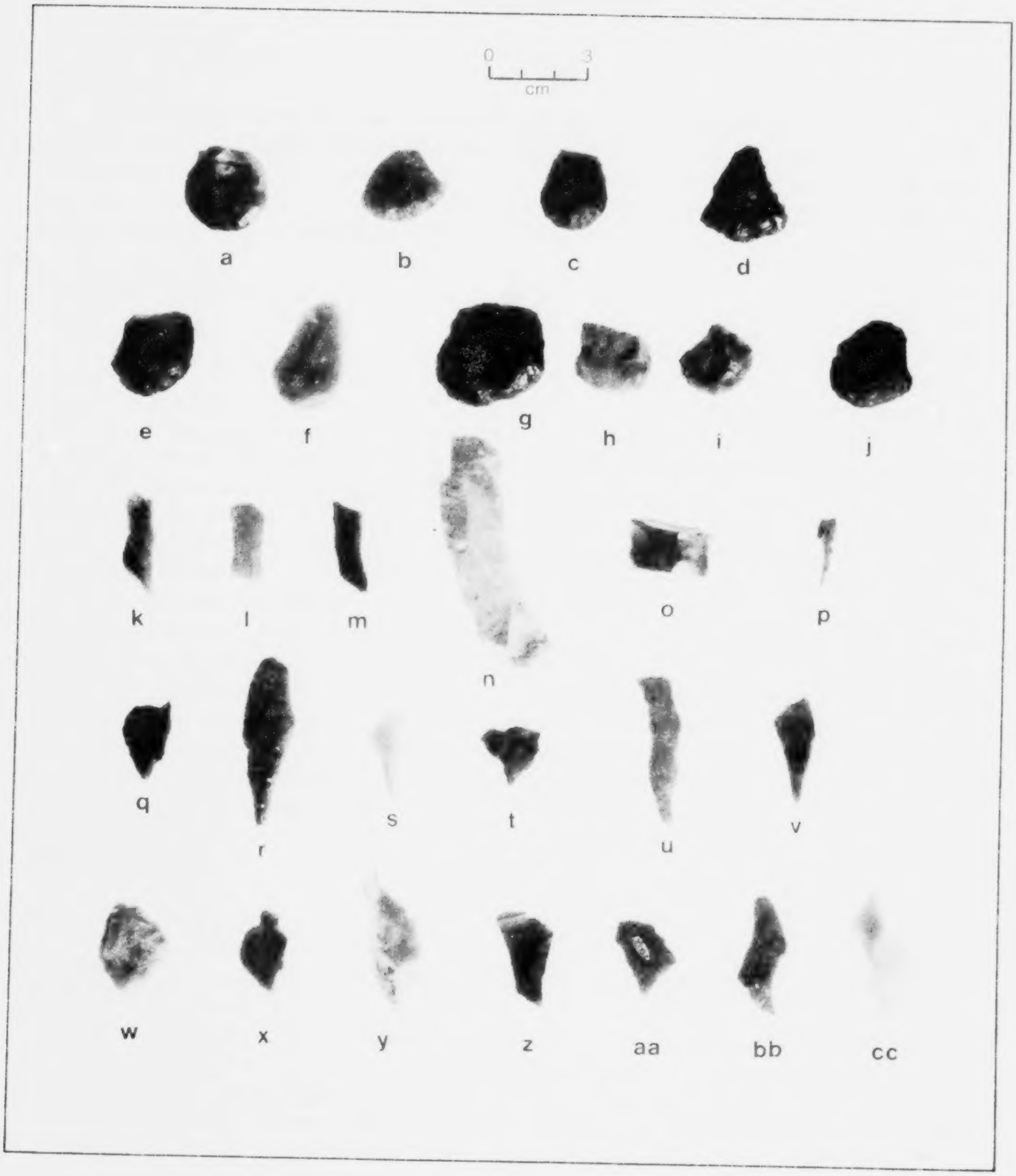
KEY:
Master Number:
Tool:
Provenience/Level:
Zone:
Material:

a.	2643	Scraper	9N70E/90	11	Jasper
b.	2453	Scraper	21N59E/90	33	Jasper
c.	1488	Scraper	80N70E/60/F100	52	Jasper
d.	232	Scraper	114N67E/30	81	Jasper
e.	2109	Scraper	4N60E/170	12	Jasper
f.	1655	Scraper	77N70E/130/F31	61	Chalcedony
g.	2704	Scraper	114N73E/120	72	Jasper
h.	2201	Scraper	114N76E/70	72	Jasper
i.	2167	Scraper	116N74E/60	72	Jasper
j.	268	Scraper	113N63E/90	82	Jasper
k.	2130	Scraper	3N61E/80	11	Chalcedony
l.	505	Scraper	19N57E/30	31	Chalcedony
m.	1239	Scraper	75N68E/80/F100	53	Jasper
n.	508	Scraper	19N57E/110/F117	34	Opal
o.	2755	Burin	7N71E/70	11	Jasper
p.	1778	Burin	77N72E/100	61	Jasper
q.	1575	Drill	82N71E/60/F100	53	Jasper
r.	2597	Graver	7N57E/130	12	Jasper
s.	2484	Drill	21N66E/210	24	Jasper
t.	2272	Drill	35N61E/180/F201	45	Jasper
u.	1225	Drill	76N68E/145/F31	61	Chalcedony
v.	1386	Drill	77N68E/140/F31	61	Chalcedony
w.	1971	Graver	44N63E/50	11	Chalcedony
x.	460	Graver	20N56E/50	32	Chalcedony
y.	896	Graver	76N65E/40	52	Opal
z.	1214	Graver	76N68E/110/F100	53	Chalcedony
aa.	2452	Graver	21N59E/80	33	Chalcedony
bb.	730	Graver	17N58E/110	34	Chalcedony
cc.	2251	Graver	36N61E/110	43	Jasper

Plate 3-11. Scrapers, burin, drills and gravers, 45-OK-11.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describing faunal and floral remains, and the structure and artifact content of cultural features.

4. FAUNAL ANALYSIS

Zoological remains from archaeological sites provide a unique source of data on animal species living in the area, and on utilization of faunal resources by human occupants. This chapter describes the faunal assemblage recovered from 45-OK-11, and summarizes the implications of the assemblage for understanding the archaeology of the site.

FAUNAL ASSEMBLAGE

The distribution of faunal remains by component is summarized in Tables 2-2 through 2-8. The vertebrate assemblage consists of 295,679 specimens weighing 106,123 g. Owing to the highly fragmented nature of the assemblage, only 8,042 fragments are identifiable. The taxonomic composition and distribution of the vertebrate assemblage for the site as a whole and broken down by component is shown in Table 4-1. Of the 8,042 identified elements 6,305 (79%) are mammalian, 665 (8%) are reptilian, 72 (<1%) are amphibian, and 1,000 (12%) are fish. The invertebrate assemblage consists of 205,471 shell fragments weighing 1,000,893 g. The shells have not been analyzed.

The following summary presents the taxa represented, criteria used to identify elements, and comments concerning past and present distribution and cultural significance. A summary of the elements representing each taxon is provided in Appendix C. The assemblage is dominated by extremely fragmented artiodactyl elements as would be expected if the bones were crushed for marrow extraction (Leechman 1951). Most of the unidentified bone appears to be fragments of artiodactyl long bones resulting from deliberate bone crushing and from natural deterioration.

SPECIES LIST

MAMMALS (NISP=6,320)

Lepus cf. *townsendii* (white-tailed hare) -- 16 elements.

Two species of *Lepus* presently inhabit the project area, *L. townsendii* (white-tailed hare) and *L. californicus* (black-tailed hare). A third species, *L. americanus* (snowshoe hare), inhabits regions adjacent to the project area. These elements could not be assigned to species on the basis of morphological features. *L. californicus* is thought to have immigrated from the Great Basin during the early part of the twentieth

Table 4-1. Taxonomic composition and distribution of vertebrate remains from 45-OK-11.

Taxa[3]	Component				Unassigned		Site Total	
	Hudnut		Kartar					
	NISP[1]	MNI[2]	NISP	MNI	NISP	MNI	NISP	MNI
MAMMALIA (NISP=6,320)								
Leporidae								
Lepus cf. *townsendii*	2	1	14	2	–	–	16	2
Sciuridae								
Marmota flaviventris	60	8	255	17	–	–	315	19
Spermophilus spp.	2	2	6	1	–	–	8	1
Geomyidae								
Thomomys talpoides	60	7	507	58	4	1	571	58
Heteromyidae								
Perognathus parvus	91	16	244	33	–	–	335	59
Castoridae								
Castor canadensis	5	1	9	1	–	–	14	1
Cricetidae	6	–	8	–	–	–	14	–
Peromyscus maniculatus	4	3	14	6	–	–	18	7
Neotoma cinerea	1	1	–	–	–	–	1	1
Microtus spp.	1	1	14	8	–	–	15	9
Lagurus curtatus	3	1	–	–	–	–	3	1
Ondatra zibethicus	–	–	1	1	–	–	1	1
Erethizontidae								
Erethizon dorsatum	6	1	68	4	–	–	74	4
Canidae								
Canis spp.	17	–	22	–	–	–	39	–
Canis lupis	1	1	3	1	–	–	4	1
Canis familiaris	–	–	5	1	–	–	5	1
Vulpes vulpes	1	1	–	–	–	–	1	1
Ursidae								
Ursus americanus	–	–	4	1	–	–	4	1
Ursus arctos	1	1	–	–	–	–	1	1
Mustelidae								
Martes americana	–	–	2	2	–	–	2	2
Taxidea taxus	–	–	1	1	–	–	1	1
Mephitis mephitis	–	–	8	2	–	–	8	2
Felidae								
Lynx cf. *rufus*	2	1	5	1	–	–	7	1
Cervidae	14	–	307	–	–	–	321	–
Cervus elaphus	24	1	24	2	–	–	48	2
Odocoileus spp.	232	2	1,432	23	4	1	1,668	23
Antilocapridae								
Antilocapra americana	10	1	56	3	1	1	67	3
Bovidae								
Bison bison	2	1	10	1	–	–	12	1
Ovis canadensis	15	2	335	6	–	–	350	8
Deer-Sized	236	–	1,815	–	8	–	2,059	–
Sheep-Antelope	88	–	208	–	–	–	296	–
Elk-Sized	8	–	19	–	–	–	27	–
REPTILIA (NISP=764)								
Chelydridae								
Chrysemys picta	123	–	331	–	–	–	454	–
Colubridae	120	–	90	–	1	–	211	–
AMPHIBIA (NISP=72)								
Ranidae/Bufonidae	11	–	61	–	–	–	72	–
PISCES (NISP=1,000)								
Salmonidae	63	–	276	–	–	–	339	–
Cyprinidae	138	–	522	–	1	–	661	–
TOTAL (identified specimens)	1,347	–	6,676	–	19	–	8,042	–
Bone Count	80,979		203,667	–	1,033	–	285,679	–

[1] NISP=number of identified specimens.
[2] MNI=minimum number of individuals.
[3] Although there are bird bones in the assemblage, none were identified to the family level.

century (Couch 1927; Dalquest 1948). L. americanus is largely nocturnal and secretive, and inhabits wooded areas. Consequently, these specimens have been tentatively assigned to L. cf. townsendii. Hares were hunted by ethnographically known groups, both for furs and for meat (Ray 1932:87; Post 1938:24).

Marmota flaviventris (yellow-bellied marmot) -- 315 elements.

All marmot remains have been tentatively assigned to the species M. flaviventris on the basis of present distribution. This species is the only marmot now living in the project area, and is a common resident of talus slopes. Marmots were exploited as a small game resource by ethnographic inhabitants of eastern Washington (Ray 1932; Post 1938).

Spermophilus spp. (ground squirrel) -- 8 elements.

Three species of ground squirrels are currently found in eastern Washington: Spermophilus columbianus, S. washingtoni, and S. townsendii. S. columbianus is larger than the other two and prefers more mesic habitats. S. washingtoni and S. townsendii are smaller and prefer sagebrush and grass zones to the south and east of the project area (Dalquest 1948:268; Ingles 1965:169). These elements could not assigned to species.

Ground squirrels have been reported as a food resource in the ethographic literature (Ray 1932:82).

Thomomys talpoides (northern pocket gopher) -- 571 elements.

Thomomys talpoides is the only geomyid rodent in the project area. Because pocket gophers are extremely fossorial and there is very little evidence that they were utilized prehistorically or ethnographically, their presence in this assemblage may be considered fortuitous.

Perognathus parvus (Great Basin pocket mouse) -- 335 elements.

Perognathus parvus is the only heteromyid rodent known in the project area. Like the pocket gophers, P. parvus is most likely present as a result of natural agents of deposition.

Castor canadensis (beaver) -- 14 elements.

Beaver is a native inhabitant of a wide variety of river habitats in Washington (Dalquest 1948). There is ethnographic evidence that beaver were exploited (Post Spier 1938), presumably for their pelts and as a food resource, although neither is explicitly stated. Beaver teeth are known to have been used by the Coeur d'Alene to incise wood, bone, antler, and soft stone (Teit 1930).

Peromyscus maniculatus (deer mouse) -- 18 elements.

Deer mice are residents of all habitat types in the project area. There is no evidence that deer mice were ever utilized.

Neotoma cinerea (bushy-tailed woodrat) -- 1 element.

Woodrats are common in the project area, but it is reported that they were not exploited by ethnographically known people because of the unpleasant odor of the meat (Ray 1932). There is no reason to suspect that this single element was culturally deposited.

Microtus sp. (meadow mouse) -- 15 elements.

Three species of *Microtus* occur in the site area: *M. montanus*, *M. pennsylvanicus* and *M. longicaudus*. All three species inhabit marshy areas or live near streams. *M. montanus* can also be found in more xeric areas. None of the elements in this assemblage could be assigned to species. There is no evidence that microtine mice were culturally deposited.

Lagurus curtatus (sagebrush vole) -- 3 elements.

Sagebrush voles inhabit dry sagebrush areas with little grass (Maser and Storm 1970:142). Only cranial material of this species is distinguishable from *Microtus* sp. The occlusal surface of M^3 (Maser and Storm 1970) and the location of the mandibular foramen (Grayson 1984) are distinctive. Like the other small mice, *L. curtatus* is most likely fortuitously included in this assemblage.

Ondatra zibethicus (muskrat) -- 1 element.

Muskrats are active year round in the project area. Ethnographically they were exploited during the winter months (Ray 1932), undoubtedly because the waterproof pelt is at its prime in winter. There is no ethnographic record that the meat of this animal was eaten.

Erethizon dorsatum (porcupine) -- 74 elements.

Porcupines are largely arboreal and prefer areas of coniferous trees. They are common in wooded areas near the site. Although they were not a popular food item among the ethnographically known people, there was no taboo against eating porcupines (Ray 1932:90). Embroidery of porcupine quills was used to decorate garments (Post and Commons 1938:45; Ray 1932:50).

Canis spp., C. lupus, C. familiaris, Vulpes vulpes (wolf, dog, coyote) -- 49 elements.

Both Canis latrans (coyote) and C. familiaris (domestic dog) are common in the project area today. C. latrans is an indigenous species, and C. familiaris has great antiquity in the northwest (Lawrence 1968). C. lupus (wolf) also is known to have been a local resident in the past, but has been locally extinct since about 1920 (Ingles 1965). Dogs were used ethnographically for hunting deer, but were not eaten except in emergencies (Post 1938). Coyotes, however, were considered good food (Ray 1932:90).

The elements assigned to the species C. lupus and V. vulpes were identified on the basis of size. C. familiaris was recognized by crowding and morphology of the dentition (Krantz 1959).

Ursus americanus (black bear), Ursus arctos (grizzly bear) -- 5 elements.

Both species of bear are native to Washington state, Black bear occurs in greatest abundance in the forested uplands (Dalquest 1948:172), but is known to frequent the banks of the Columbia River during berry season (Ray 1932:82). Grizzly bears are now extinct throughout Washington state, and apparently never enjoyed as wide a distribution as the black bear (Dalquest 1948). There are ethnographic records for hunting of both species (Ray 1932; Post 1938).

Species level identifications in this assemblage were made on the basis of size.

Martes americana (marten)-- 2 elements.

The western marten is arboreal and has not been recorded as a resident of the project area. There are ethnographic reports that martens were trapped in the adjacent uplands (Ray 1932:85).

Taxidea taxus (badger) -- 1 element.

The badger is a powerful burrower and is found thoughout eastern Washington, though not in large numbers (Ingles 1965). Badgers were trapped regularly by the Sanpoil and Nespelem (Ray 1932:85).

Mephitis mephitis (striped skunk) -- 8 elements.

Striped skunks are common inhabitants of streamside thickets throughout the project area. As with the porcupine, there was no taboo against eating skunk among the ethnographic people (Ray 1932:90); but skunk was not popular in the diet.

Lynx cf. rufus (bobcat) -- 7 elements.

Bobcat (L. rufus) and Canadian lynx (L. canadensis) are extremely difficult to distinguish osteologically. Postcranially, the major difference between the species is size -- the bobcat is somewhat smaller. These elements have tentatively been assigned to L. rufus on the basis of size. Bobcats are ubiquitous in Washington, while Canadian lynx are less common and inhabit the forested regions in the higher mountains (Ingles 1965). Bobcats were taken with traps or deadfalls (Ray 1932:85).

Cervus elaphus (elk) -- 48 elements.

Elk are rare in the extant local fauna of the project area. The closest population is in the Cascade Mountains to the west (Ingles 1965). Elk bones occur in low frequencies in many archaeological sites in eastern Washington, however, indicating that elk once occupied a more extensive range than at present and/or that people were traveling some distance to hunt them.

Odocoileus spp. (deer) -- 1668 elements.

Two species of deer may be represented in this assemblage, Odocoileus hemionus and O. virginianus. Deer represented a major food resource for the prehistoric inhabitants of eastern Washington (Gustafson 1972), as they did for the ethnographic cultures (Post 1938; Ray 1932).

Antilocapra americana (pronghorn antelope) -- 67 elements.

Although antelope are present today in Washington only as an introduced species (Ingles 1965), antelope remains are common in both historic and prehistoric archaeological sites, especially in the arid part of the Columbia Basin (Gustafson 1972; Osborne 1953). There are ethnographic records of hunting practices associated with antelope procurement (Ray 1932; Post 1938).

Bison bison (American bison) -- 12 elements.

Bison are known from project area assemblages dated between A.D. 500 and A.D. 1500. They have been reported ethnographically but never were observed in this area by European settlers (Schroedl 1973). The close skeletal similarity between Bos and Bison makes it difficult to distinguish between them (Olsen 1960). These specimens, however, were identified on the basis of the depth of the deposits from which they were recovered.

Ovis canadensis (mountain sheep) -- 350 elements.

Mountain sheep occur in archaeological sites in eastern Washington with some regularity. The presence of this species is somewhat difficult to interpret, however, because references to it in the ethnographic literature are scarce. Moreover, when competition with man and domestic stock for range became severe during historic times, the habitat preference of this species appears to have changed (Manville 1980). Mountain sheep are known ethnographically to have been exploited both for meat and as a source of bone for tools (Spinden 1908).

REPTILIA (NISP= 764)

Chrysemys picta (painted turtle) -- 454 elements.

Painted turtle is the only native turtle currently living in the project area. *Clemmys marmorata* (western pond turtle) has been reported in the eastern part of Washington in the ethnographic literature (Ray 1932:87), but this would represent a major extension of the known range of *C. marmorata*. At the present, *C. marmorata* only occur on the west side of the Cascades and in the southern part of the state. Because there is no way of verifying that any other turtle has ever lived in the project area, and no indication that they were imported, all turtle remains have been assigned to *C. picta*. Turtles were regularly taken by ethnographically known people as a food source (Ray 1932:87). The incidence of burned turtle elements indicates they were used at this site.

Colubridae (Colubrid snakes) -- 211 elements.

Snake vertebrae were identified to family on the basis of size. There are at least four species of snakes living in the project area that may be represented by these vertebrae: *Coluber constrictor* (western yellow-bellied racer), *Pituopis melanoleucus* (gopher snake), *Thamnophis sirtalis* (valley garter snake), and *T. elegans* (wandering garter snake). Most snake elements appear to be intrusive.

AMPHIBIANS (NISP=72)

Ranidae/Bufonidae (frogs and toads) -- 72 elements.

Both frogs and toads inhabit the project area (Stebbins 1966). Inadequate comparative material precluded assigning these elements to the correct family. Like those of the snakes, these elements appear to be intrusive.

PISCES (NISP=1,000)

Salmonidae (salmon, trout, and whitefish) -- 339 elements.

These vertebrae could belong to any of at least eight species of salmonid fish known in the project area. All fish vertebrae with parallel-sided fenestrated centra were assigned to this family. Salmonid fish represented a major food resource for ethnographic tribes (Ray 1932; Post 1938; Craig and Hacker 1940). The high incidence of burned and broken vertebrae in this assemblage indicates salmonid fish were utilized at this site.

Cyprinidae (carp and minnows) -- 661 elements.

Inadequate comparative collections precluded more specific identification of fish vertebrae. Assignment of nonsalmonid fish vertebrae to family was made on the basis of size. At least seven species of cyprinid fish occur in the project area. Some ethnographic groups exploited these fish (Post 1938). These fish remains are probably present as a result of human activity.

SUBSISTENCE

The faunal assemblage includes taxa that were deposited by both cultural and natural agents. The cutting of skin and meat from bone may result in striae, and the deliberate breakage of bone in flaking: such marks are used here as evidence of cultural agents of deposition. Butchering marks have been tabulated by element for this assemblage in Appendix C, Table C-1. Burned bones, also indicators that cultural activities operated in the depositional process, are tabulated as well in Appendix C, Table C-1.

Artiodactyls are the primary subsistence resource represented in the faunal assemblage, constituting over 26% of the total identified vertebrate elements. Deer (Odocoileus sp.) elements make up the largest portion of the artiodactyl assemblage, especially in the Kartar component. Mountain sheep, antelope, elk and bison also represent subsistence resources and are present in both components. The highly fragmented nature of the artiodactyl assemblage suggests intensive use of the large mammals. When deer-sized and elk-sized elements are considered as well as those identified to species, all parts of the skeleton are represented. Allowing for differences in bone densities and preservation, the data in Appendix C, Table C-1 suggest that all parts of the skeletons of the small artiodactyls were brought back to the site and utilized.

The high incidence of carnivores (marten, badger, black and grizzly bear, fox, wolf and lynx), as well as the occurrence of beaver and muskrat suggests procurement of hides. Ethnographic evidence indicates that some carnivores were eaten (Ray 1932; Post 1938). There is, however, no way to distinguish taxa used for their hides from those eaten in this archaeological assemblage. Some, such as the bears, may have been used for both purposes.

The presence of grizzly bear and marten indicates that procurement of the fauna represented at 45-OK-11 was not entirely opportunistic. Grizzly bear and marten prefer higher elevation habitats with more trees than exist in the vicinity of the site. Such habitats exist within a few days walk of the site. We attribute the presence of these taxa to wide ranging human rather than to extensive environmental change.

Several of the small mammals may be represented as a result of use for food and furs. Hares, ground squirrels, marmots and porcupines were eaten by ethnographically known people (Post 1938; Ray 1932). These taxa undoubtedly are present in this assemblage as the result of similar use prehistorically, while the gophers and mice most likely are present as the result of natural deposition. However, Stahl (1982) has recently demonstrated that small mammals offer a high meat yield per live weight and that they are relatively abundant in environments associated with human activity. He argued that many small mammals may well have been a rich food resource in prehistoric subsistence systems. The possibility that mice and gophers were utilized at 45-OK-11 cannot be discounted, but only a small number of small rodent elements were burned and none showed evidence of butchering. The evidence is inconclusive whether the small rodents were utilized or if some were burned in the course of general disposal of refuse. Because many small rodents are abundant in the site area and burrow extensively, it is likely that most occur in this assemblage as a result of natural deposition.

Turtle shell fragments occur in high frequency in both components. Ethnographic analogy (Ray 1932:82) and the frequency of burned shell fragments suggests that turtles were sought for food. There is, however, no evidence that the frog/toad elements represent a food resource.

Both salmonid and cyprinid fish are represented in this assemblage and undoubtedly represented a major food resource for site occupants as they did for ethnographically known tribes (Ray 1932; Post, in Spier 1938; Craig and Hacker 1940). There are approximately twice as many cyprinid as salmonid remains in both components. Salmonid vertebrae tend to be more fragmented and a greater percentage are burned, which may indicate differences in the manner in which fish of the two families were processed. Taphonomic processes may also account for the differences observed; the salmonid vertebrae are more delicately constructed and may break more easily (Casteel 1976:88-92).

SEASONALITY

Two kinds of data that indicate season of site occupation were recovered from the faunal assemblage. The first is age at death of taxa with a known season of birth. The ages at death for 25 deer have been estimated by reference to criteria described by Robinette et al. (1957) and Severinghaus (1949). Ages at death for four antelope were established by reference to criteria described by Dow and Wright (1962). Deer and antelope generally give birth in May or June (Ingles 1965). From the age at death and the season of birth, the season at death can be estimated. The second source of seasonal data is the presence of seasonally active taxa. Elements from two such taxa--Marmots (Marmota flaviventris) and painted turtles (Chrysemys picta)--are present in both components. Marmots enter estivation in June and go into hibernation in August or September. They emerge in March (Ingles 1965; Dalquest 1948). Painted turtles hibernate from late October until March or April (Stebbins 1966; Ernst and Barbour 1972).

The seasons of site occupation indicated by each of the seasonally sensitive taxa are summarized in Table 4-2. The range of months indicated by deer and antelope has been extended because the wear pattern from which age is assessed is highly variable. Not only does dental wear depend on location of the population and forage type, but variation increases with age of the animal.

In the Hudnut Component there are no ageable artiodactyls. The other taxa indicate the site was occupied at least during the spring (March-June). Taxa from the Kartar Phase component indicate that occupation occurred during all seasons. Marmots and turtles were taken during the spring, antelope during the fall and winter, and deer throughout the year.

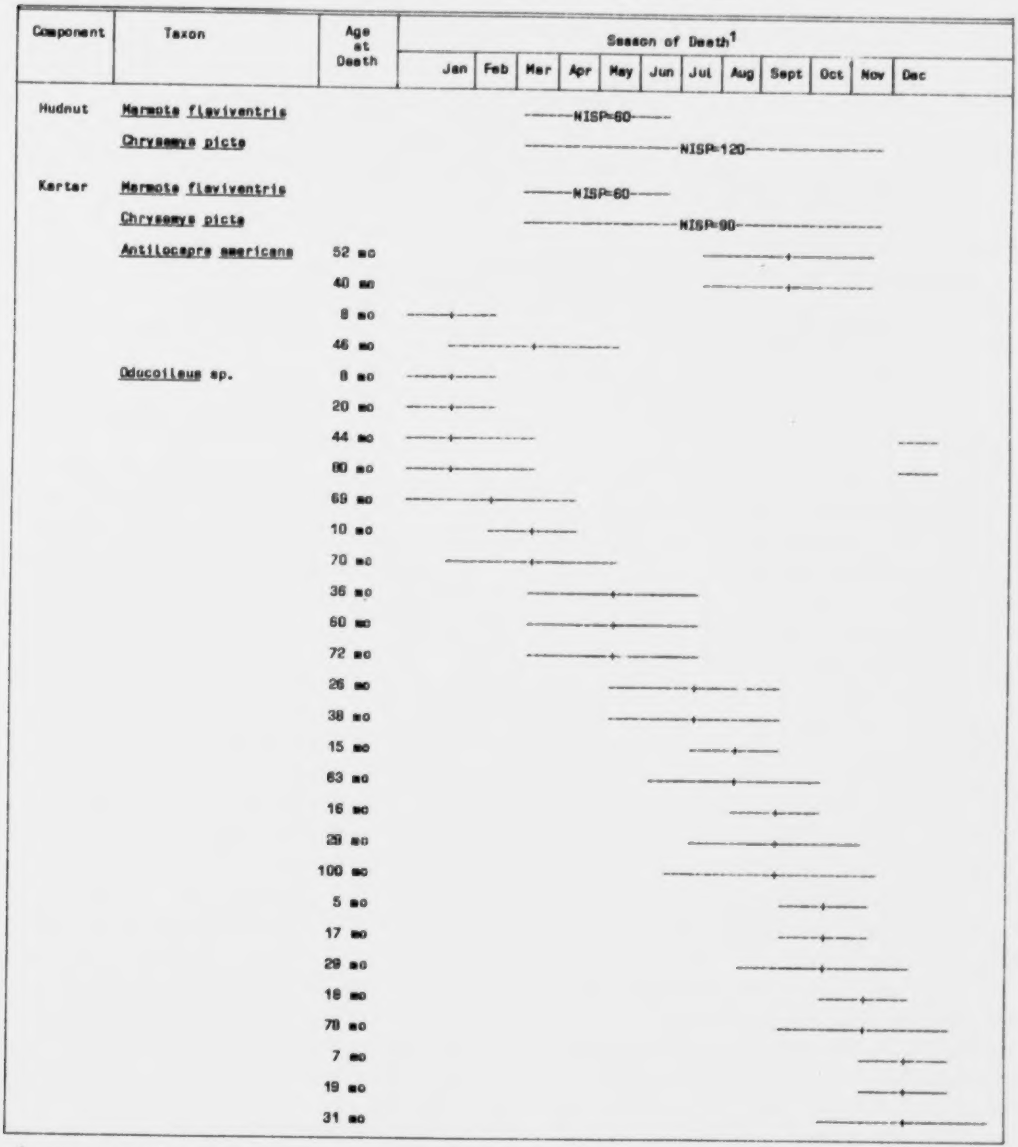
PALEOENVIRONMENTS

There are six taxa of small mammals for which there is no evidence of deliberate cultural intervention in the depositional process. These six taxa were placed into two groups in Table 4-3 based on habitat preference data provided by Dalquest (1948) and Ingles (1965). If we assume that the changing abundances through time of the two groups reflect changing abundances of mesic and xeric habitats in the site area, we may use the relative abundances of these taxa as an indicator of prehistoric environmental change. It should, however, be kept in mind that human habitation could affect habitat preference (cf. Justafson 1972).

Examination of Table 4-3 reveals there was a shift in proportions of mesic versus xeric taxa between the components, regardless of whether element counts or minimum numbers are considered. The Kartar Component is dominated by the more mesic taxa, particularly Thomomys talpoides. T. talpoides accounts for 65% of the total number of elements and 55% of the individuals. Perognathus parvus, one of the two taxa that prefer relatively more xeric habitats, is the dominant taxon in the Hudnut component. The other taxon in the xeric group, Lagurus curtatus, occurs only in the later component.

Using the assumption that relative abundances of taxa preferring mesic versus those preferring xeric habitats reflects the abundances of those habitats in the local environment, and further assuming that changing abundances of habitat types is a function of climatic conditions, the abundances of the taxa included in Table 4-3 indicate that climatic conditions were relatively cooler and/or moister during the Kartar Phase occupation than during the time represented by the Hudnut component. The magnitude of the change cannot be estimated from this evidence.

Table 4-2. Distribution of seasonal indicators, 45-OK-11.



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[1] Because reliability of age estimates for artiodactyls decreases with increasing age, we use a two month span for season of death for individuals ≤24 months, a four month span for individuals >24 months and <100 months, and a five month span for individuals ≥100 months.

Table 4-3. Paleoenvironmental indicators, 45-OK-11.

Taxon	Hudnut Component				Kartar Component			
	NISP	%	MNI	%	NISP	%	MNI	%
Thomomys talpoides	60	38	7	24	507	65	58	55
Peromyscus maniculatus	4	3	3	10	14	2	6	6
Neotoma cinerea	1	1	1	4	0	0	0	0
Microtus sp.	1	1	1	4	14	2	9	8
Mesic Taxa	66	41	12	41	535	69	73	69
Perognathus parvus	91	57	16	55	244	31	33	31
Lagurus curtatus	3	2	1	4	0	0	0	0
Xeric Taxa	94	59	17	59	244	31	33	31

SUMMARY

The vertebrate fauna from 45-OK-11 is representative of the fauna expected in the project area. Antelope, sheep and bison are the only taxa represented that no longer live in or near the site area. All three taxa became locally extinct in late prehistoric or historic times (Dalquest 1948; Taylor and Shaw 1929; Schroidl 1973). Otherwise, all taxa either occur in the site area, or there is reason to believe they were introduced into the assemblage from nearby areas by cultural activities associated with the procurement of food and hides. It appears that the faunal assemblage, with the exception of the mouse, gopher, snake, and frog/toad elements, represents an accumulation of refuse from economic activities.

The mammalian fauna is predominantly small artiodactyl (deer, sheep, antelope) remains with a small number of large artiodactyl (elk, bison) elements. Most of the assemblage is extremely fragmented, indicating intensive use and/or poor preservation. The mammalian assemblage also includes an array of carnivores and large rodents that undoubtedly represents resources exploited for furs as well as food.

The small rodents, gophers and mice, show no evidence of cultural use. They are most likely present in this assemblage as the result of natural deposition. The relative abundances of these small taxa indicate that the site environment was wetter and/or cooler when the Kartar component was deposited than it was when the Hudnut component B was deposited.

The non-mammalian vertebrate assemblage includes turtles and at least two kinds of fish that probably were used by site inhabitants. The snake and frog/toad elements are most likely present as the result of natural deposition.

5. BOTANICAL ANALYSIS

The study of vegetable materials found in archaeological matrices, termed archaeobotany or paleoethnobotany (Dimbleby 1967; Renfrew 1973; Dennel 1976; Ford 1979), provides valuable information about the resource base of the peoples who inhabited a site. With lithic and faunal materials, they give us the means for making inferences about the peoples' patterns of subsistence, as well as interpreting site features. The presence and condition of specific kinds of fruit seeds and flower parts, for instance, can suggest seasonality of site use.

THE BOTANICAL ASSEMBLAGE

Over 1.57 g of archaeobotanical material was identified from 56 flotation samples from three testing units at 45-OK-11. The samples, drawn from 14.7 kg of sediment, had an average carbon ratio of 0.1% and varied from 3,000 to over 5,000 years in age. Most of the flotation samples were small (under 100 g) and were given sugar separation. Six samples weighing 9.6 kg were subjected to water separation. These large samples were taken from hearth Feature A, and the lower levels in units 54N72E and 84N73E. Five flotation samples from the highest levels in the units could not be assigned to zone. In addition to the 56 samples, 17 Kartar Phase flotation samples were given cursory examination. The samples were from occupation debris in Upper Housepit 1 and Lower Housepit 1 in 84N73E and ranged in age from about 4,700 to 5,000 years ago. Two produced food remains (*Lomatium* tissue and goosefoot seed).

The three testing phase units, 24N67E, 54N72E, and 84N73E, were positioned near the rims of Housepits 1 and 3, and 10 in Block Area 2. The three test units include both Hudnut and Kartar components. Thus the botanical flotation samples represent a large array of domestic garbage deposited outside semipermanent structures.

Carbon purity levels are not high for most flotation samples (Figure 5-1). Bioturbation is present. Most of the contaminant weight, however, is from large amounts of cultural material in the flotation samples--particularly bone, shell, fish, lithic flakes, and ground pigment. Some items are unevenly distributed throughout the levels. Shell fragments, for example, tend to be heavily concentrated in Kartar Phase flotation samples and relatively lightly present in Hudnut flotation samples. Red to orange pigment lumps associated with pigment-stained quartzite grains are found in both phases, but are particularly evident in Hudnut flotation samples. Presence of non-botanical cultural material will be mentioned in a later section.

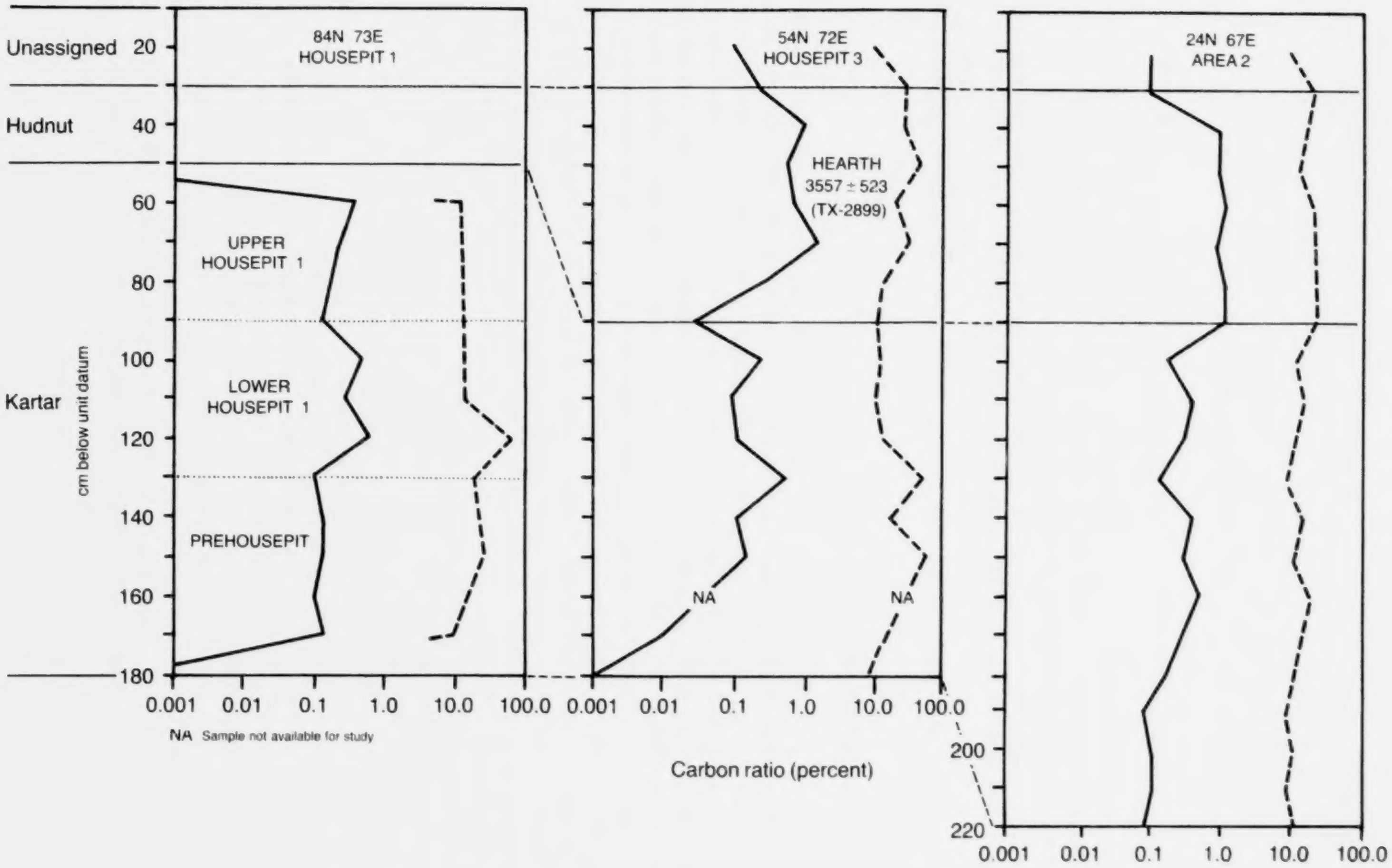


Figure 5-1. Carbon to soil ratio (solid line) and carbon purity (dashed line) by component and unit level, 45-OK-11.

The botanical assemblage from 45-OK-11 is shown in Table 5-1, and consists of 62% conifer, 28% hardwood, 2% edible material and 8% other tissue by weight. The most prominent coniferous species are members of the pine family; the most important hardwood is bitterbrush. Some pieces of larch, and the birch from Hudnut Phase flotation samples, are incompletely carbonized. We have noted incomplete carbonization of wood and other floral material in previous investigations, but none have been as old as these approximately 3,500 year old samples.

The edible material consists largely of seed fragments and fruit tissue. The oldest example is a serviceberry seed from Kartar levels at the bottom of 24N67E in U.L. 210; field notes associate it with turtle bones. Two species of goosefoot (Chenopodium spp.) are also represented--two western goosefoot (C. fremontii) seeds are from Hudnut debris. Three seeds of smaller-seeded goosefoot (species unknown) are found in both phases, and the fragments are too small to identify reliably. None of these remains form a concentration like that noted from 45-OK-258 (Jaehnig 1983b).

Charred edible root material is rare at 45-OK-11. Had we not searched the additional 17 samples, none would have been identified. Fortunately, well-preserved lomatium root tissue was identified from one of the samples from Upper Housepit 1 (Kartar Phase). A few samples of charred tissue, probably parts of fleshy fruits, were identified from five Kartar flotation samples as well. Three had associated seed wall fragments. One of these, recovered from the very bottom of 54N72E, is probably wild strawberry (Fragaria sp.). This family is not found at the site, and the nearest such plants grow in the mountains under ponderosa pine. Two other Kartar flotation samples contain tissue that probably belongs to hawthorn (Crataegus sp.) seeds. The identification of strawberry is reasonably secure (we have contemporary wild seeds in our comparative collection); but the identification of nut hull tissue is tentative. With so many unknown bits and "probables" in the array, we find it difficult to assess the amount of edible tissue. If all the above are properly identified, then 25% of the flotation samples contain edible tissue. If only materials whose identification we are most sure of are considered--goosefoot seeds, serviceberry, strawberry, and fruit tissue--the incidence drops to 14%. Table 5-1 reflects this latter figure. The seed walls and possible hawthorn seed tissue have been placed in the Other Tissue category.

The Other Tissue category also contains bitterbrush seeds from Hudnut flotation samples and grass flower parts. One grass represented is from the millet family (Panicum sp., panic grass) from Zone 99 (not assigned to a phase). The same flotation sample sample also contains immature florets from a medium stemmed grass in the fescue tribe. And one of 17 flotation samples examined for important plants from Upper Housepit 1, Kartar Phase, contained remains of rye grass (Elymus sp.). The bitterbrush seeds and the grass florets are good summer season indicators. A bit of twisted cordage or tissue was identified from the Upper Housepit 1 floor. The material is the same as that found at 45-OK-2 (Campbell 1984d). We are uncertain of the nature of the material; it may not be floral at all, but, rather, a bit of sinew thread. A

Table 5-1. The botanical assemblage of 45-OK-11 by flotation weight (g) and number of appearances (#) in 56 samples.

Identified Botanical Material	Unassigned		Hudnut				Kartar		Total[1]	
	UL (N=5)		UL (N=15)		Feature A Hearth (N=2)		UL (N=34)			
	g	#	g	#	g	#	g	#	g	#
Conifer (62%)										
Lodgepole pine	–	–	0.03	3	–	–	0.03	3	0.06	6
Ponderosa pine	0.02	3	0.06	5	–	–	0.27	15	0.35	23
Yellow pine	-0.01	2	0.07	9	-0.01	2	0.16	21	0.23	34
Douglas fir	-0.01	1	0.01	6	–	–	0.06	16	0.07	23
Larch	-0.01	1	0.04[2]	5	-0.01	1	0.05	10	0.09	17
Hemlock	–	–	–	–	–	–	-0.01	1	-0.01	1
Pinaceae	–	–	0.01	1	–	–	0.01	3	0.02	4
Juniper	–	–	-0.01	1	–	–	-0.01	2	-0.01	3
Cupressaceae	–	–	0.01	1	–	–	–	–	0.01	1
Bark	-0.01	1	0.01	7	–	–	0.02	11	0.03	19
Cone	–	–	–	–	-0.01	1	–	–	-0.01	1
Pitch	–	–	0.01	8	–	–	0.02	13	0.03	21
Other	–	–	0.02	4	–	–	0.07	14	0.09	18
Hardwood (28%)										
Sage	-0.01	1	-0.01	2	–	–	–	–	-0.01	3
Bitterbrush	0.04	4	0.15	12	0.18	2	0.03	10	0.40	28
Serviceberry	–	–	–	–	–	–	-0.01	1	-0.01	1
Serv/Haw	–	–	0.02	7	–	–	0.01	4	0.03	11
Rosaceae	–	–	–	–	–	–	0.01	5	0.01	5
Mock orange	–	–	–	–	–	–	0.01	1	-0.01	1
Clematis	-0.01	1	–	–	–	–	–	–	-0.01	1
Birch	–	–	-0.01[2]	1	–	–	-0.01	1	-0.01	2
Bark	–	–	-0.01	3	–	–	-0.01[3]	3	-0.01	6
Edible Tissue (2%)										
Seeds	–	–	0.01	3	–	–	0.01	4	0.02	7
Other	–	–	–	–	–	–	0.01	6	0.01	6
Other Tissue (8%)										
Seeds	0.01	1	0.01	4	-0.01	1	-0.01	1	0.02	7
Grass	–	–	-0.01	1	-0.01	1	-0.01	4	-0.01	6
Fiber?	–	–	-0.01	1	–	–	–	–	-0.01	1
Herbaceous	0.01	4	0.02	12	-0.01	1	0.07	27	0.10	43
Other	–	–	–	–	-0.01	1	-0.01	4	-0.01	5
Total	0.08		0.48		0.18		0.83		1.57	

[1] Lomatium tissue and one goosefoot seed noted in the cursory examination of 17 other flotation samples have not been included.

[2] Some specimens incompletely carbonized.

[3] Birch bark present in one flotation sample.

material; it may not be floral at all, but, rather, a bit of sinew thread. A question mark on the chart indicates our uncertainty.

The most striking feature of the assemblage is the change in the ratio of coniferous species and hardwoods over time. Kartar Phase woods are nearly all coniferous (93% by weight); the only hardwood of note is bitterbrush. Hudnut woods are mostly hardwoods, 56% by weight. Sage appears for the first time in the Hudnut Phase.

We have noted the tendency of older components in sites along the Reservoir to be represented by more conifer wood. The large number of Kartar flotation samples (N=35) strengthens this observation. The absence of sage wood in Kartar flotation samples is worthy of note. Easily identified, sage prefers a fairly dry climate. While it is an important member of the woody flora of later components, it is absent in Kartar flotation samples.

One explanation might be a change in climate. The early inhabitants of the region might have burned more conifer wood because it was more available. The climate may have been moister then, and sage, a plant that requires a dry climate, may not have been easily obtained. Alternately, the inhabitants may have preferred coniferous firewoods to sage wood, and so ignored that wood whenever the preferred sort was available.

The assemblage of flotation sample material is presented below arranged alphabetically by family. Possible uses are suggested from information supplied in the ethnobotanical and ethnographic literature. Seasonality data are included where pertinent.

APIACEAE (Umbelliferae, Parsley or Celery Family)

Lomatium Raf. (desert parsley, biscuitroot)

Charred Lomatium root tissue was identified from one of 17 flotation sample samples given cursory examination. The sample was from the floor of Upper Housepit 1. A radiocarbon sample from a hearth on the floor indicates the tissue is about 4,700 years old (TX-3380).
Although species cannot be assigned on the basis of root tissue alone, the fragments probably belong to a species with large storage roots such as L. macrocarpum, L. canbyi or L. farinosum. One of these, L. canbyi, is still being collected by Colville tribal members. It grows in Douglas County. The other two species are found on the reservation. Lomatium roots were collected in the spring from March through June. Some were eaten fresh, boiled, dried or cooked in pits with other foods. At least one kind was made into cakes and dried (Turner et al. 1980:64-65, 68-69).

ASTERACEAE (Compositae, Daisy Family)

Artemisia tridentata Nutt (sagebrush, big sage)

Only three flotation samples contained sage charcoal. Two traces were found in Hudnut flotation samples from 24N67E, and another represented by twig ends was from the same unit but could not be assigned to zone. Sage is not common at the site and its relative absence is noteworthy. We have suggested that sage was used primarily for fuel in other project area sites where it was abundant. Apparently the inhabitants of 45-OK-11 during Kartar and Hudnut times made little attempt to collect the wood.

BETULACEAE (Birch Family)

Betula L. (birch)

A small amount of incompletely charred birch wood was identified from a Hudnut flotation sample in 24N73E. Charred wood, and a small sample of bark which probably is birch, are from Kartar Phase flotation samples from the same unit. The unit levels from which these remnants were extracted are associated with a shell concentration and edible remains. The wood and bark fragments are too small to identify to species. Likely candidates, however, include western birch (Betula occidentalis) and paper birch (B. papyrifera). The former species is locally abundant in moist habitats above 600 m (about 2,000 ft).

Birchwood was not highly valued although it was used as fuel (Turner et al. 1980:89). The bark was much more valuable as material for flexible containers (Ray 1932:38). Prepared birch bark strips have been found in a feature at 45-DO-214 radiocarbon dated to about 1100 B.P. (Miss 1984a). The birch at 45-OK-11 is considerably older.

CHENOPODIACEAE (Goosefoot Family)

Chenopodium fremontii Wats. (western goosefoot, pigweed)

Two charred and broken goosefoot seeds were identified from a Hudnut phase flotation sample from U.L. 90 in 54N72E. The seeds were found in occupation debris with ponderosa pine, conifer bark, bitterbrush charcoal and serviceberry/hawthorn charcoal. Fish bone, shell fragments, pigment and pigment-stained quartzite grains were found in quantity. The seeds are probably older than 3,500 years, about 1,000 years older than those found concentrated in a pit feature from 45-OK-258.

Chenopodium sp.

A second species of charred goosefoot is present at 45-OK-11, although not in sufficient numbers for species identification. One seed was taken from a hearth feature (Feature 96) in Lower Housepit 1. Two others were identified from U.L. 130 in 54N72E and U.L. 160 in 24N67E. All three seeds were found with burned and unburned shell, and bone. The seeds are small and vary from 0.7 to 0.9 mm in diameter. The seed coats are smooth, lack the pericarp, and are teardrop rather than circular in outline. They resemble those of Lamb's quarters (C. album).

CUPRESSACEAE (Cypress Family)

Juniperus scopulorum Sarg. (juniper)

Traces of charred juniper wood were identified from one Hudnut and two Kartar Phase flotation samples. The juniper from the former phase is associated with a radiocarbon date of 3557±523 (TX-2899) while that from the Kartar Phase is from Lower Housepit 1, about 5,000 years old.

Juniper trees are not common within the guide-taking area today. A few can be seen in draws and canyons on both sides of the river from Grand Coulee Dam to about RM 577. The known individual nearest to the site is in the lower Coyote Creek drainage. Others may be present on the scantily treed slopes across the water from the site, or, possibly, in the moist bottom of Hopkins Canyon.

Juniper wood was used for bows and items of small construction. The boughs were a fumigant for houses while steeped bark and branch tips were used as a remedy for cold, flu, and other ailments (Turner et al. 1980:19-20).

Other Cupressaceae

A small amount of cypress family charcoal was identified with juniper wood in 54N72E in a unit level above hearth Feature A. The pieces were too small to identify further.

In sum, cypress family members appear in 7% of the samples.

HYDRANGEACEAE (Hydrangea Family)

Philadelphus lewisii Pursh (mock orange)

A trace of mock orange charcoal appeared in a Kartar flotation sample from Upper Housepit 1 debris.

Ethnographic sources agree that mock orange was a valuable wood for bows, arrow shafts, and foreshafts or sideprongs in salmon spears (Ray 1932:87; Turner 1979:222-224; Turner et al. 1980:108). Mock orange is locally abundant within the guide-taking lines.

PINACEAE (Pine Family)

Pine family members are found in 55, or 96%, of the samples from 45-OK-11. Genera represented include pine (Pinus spp.), Douglas fir (Pseudotsuga sp.), larch (Larix sp.), and hemlock (Tsuga sp.). When pieces cannot be identified further, charcoal of these and other genera are designated Pinaceae. The term yellow pine is used for samples containing bole and branch material of ponderosa pine (Pinus ponderosa) and lodgepole pine (P. contorta) when specific names cannot be attached. Both are valued building material and good fuel.

Larix occidentalis Nutt. (Western larch)

Common at 45-OK-11, larch is found in 30% of the flotation samples. One sample from Hudnut levels is incompletely charred. The remainder are completely charred and spread fairly evenly among Kartar and Hudnut periods. Larch is not found alone and nearly always is accompanied by pine or Douglas fir, often both.

The nearest source for western larch is in moist mountainous regions above about 550 m (1,800 ft) elevation. Larches can be seen in the Condon-Harrison-Coyote Creek drainages along Kartar Road and along Highway 155 south to Smith Creek. The wood does not seem to have been valued highly as a construction material among the Okanogan, although it was used as fuel (Ray 1932:105).

Pinus contorta Dougl. ex Loud. (lodgepole pine)

Lodgepole pine charcoal is found in 6, or 11%, of the samples from Kartar and Hudnut flotation samples. The oldest sample is from a prehousepit layer in unit 84N73E and must more than 5,000 years old.

Young lodgepole pines are suited for construction purposes. The trees are found at slightly higher elevations than ponderosa pines on the Colville Reservation.

Pinus ponderosa Dougl. ex. Loud. (ponderosa pine)

Ponderosa pine is the most common conifer at 45-OK-11. Found in all zones, it appears in 40% of the samples. Much more of it occurs in Kartar than in Hudnut Phase flotation samples. Some of the pitch and bark is from this pine as well. All of the material is completely charred.

Ponderosa pines dot the terraces and hillsides of the guide-taking area today, and they grow within walking distance of the site. The tree has various uses in native manufactures, medicinal preparations, and food. Most often, however, it was probably used as fuel. Ponderosa pine was apparently the principal fuel species in Kartar times. Fully 43% of the samples contained the wood, and in those samples ponderosa pine tended to weigh more than other items. The percentage dips to 29% in Hudnut flotation samples. In those samples, the pine is often second in weight after bitterbrush charcoal (conifers tend to be the other items found in Kartar flotation samples).

Pseudotsuga _menziesii_ (Mirb.) Franco (Douglas fir)

Douglas fir appears in about as many flotation samples as ponderosa pine, 40%, but it weighs only a fifth as much. It decreases slightly from Kartar to Hudnut times. Douglas fir trees currently grow among ponderosa pine above the floodplain and in draws. The nearest source to 45-OK-11 is across the river on steep north-facing hillsides in Douglas County. The firs grow among pine almost to the water's edge. Fir was a preferred wood for implements associated with fishing and other water-associated tasks. It was made into harpoon shafts, for instance, because of its resistance to water warp (Post and Commons 1938:55,56).

Tsuga Carr. (hemlock)

Charred mature hemlock bole wood was identified from a Kartar flotation sample in U.L. 120 from 24N67E. The wood was in poor condition before it was burned.

Two species of hemlock grow in Washington State today, but it is doubtful if any are present on the Colville Reservation. The trees prefer cool temperate to subalpine habitats (Hitchcock et al. 1955:132,133). The nearest source by river is in British Columbia. Use of the wood is not reported in the ethnobotanies of our area. Thus, hemlock is one of the more exotic species at 45-OK-11.

Yellow Pine and Other Pinaceae

The yellow pine group appears in 60% of the samples and is third in weight behind ponderosa pine and bitterbrush. The taxon tends to be large in samples with lodgepole and ponderosa pine branch material. All of the pine is charred. It appears slightly more often in Hudnut flotation samples, but the amount of charcoal per sample is slightly greater in Kartar flotation samples. In other words, there is no clear change over time for this mixed group.

Four flotation samples contained pine family members not identifed to genus. Three of these are from Kartar unit levels. All of the pitch belongs to this group as well, since it is impossible to distinguish the pitch of pine, fir, spruce and larch.

Cone, Bark, and Other Conifer

There is very little cone material from 45-OK-11. A trace was found in a Hudnut hearth with a little larch and yellow pine, and a great amount of bitterbrush.

Conifer bark is found in all zones in 33% of the samples. Most of it is pine.

Finally, 18, or 32%, of the samples contain conifer charcoal which cannot be identified to family. Most of this is from Kartar Phase flotation samples. About 9% of the conifer wood by weight could not be further identified.

POACEAE (Gramineae, Grass Family)

Grass stem and leaf tissue is found in only 8% of the samples. All but one of five samples are from Kartar Phase flotation samples. All the material is charred and belongs to fairly small-stemmed grasses. Flowering or seeding material is found in two other flotation samples. Three-quarters of a grass floret (ovary or seed surrounded by other structures--lemma and palea in this case) most likely is panic grass (*Panicum* sp. probably *scribnerianum*. The remains were found in U.L. 30 in 24N67E along with a small unidentified seed, bitterbrush charcoal, and a trace of pine. No regional ethnobotany lists this grass; however, grasses were used for a variety of purposes in general (Turner 1979:135-136; Turner et al. 1980:53-54).

Three portions of other grass florets were identified from Hearth Feature A in 54N72E. The florets are immature, but structural details strongly indicate the grass in question is from the fescue tribe, a large and important group with numerous genera. The condition of the flowering parts indicates (early) summer burning.

Finally, one of the 17 flotation samples given cursory treatment had traces of a large-stemmed rye grass (*Elymus* sp. probably *cinereus*). Stem and leaf material were from the floor of Upper Housepit 1. Rye grass was one kind used as pit linings and flooring material (Turner et al. 1980:55).

RANUNCULACEAE (Buttercup Family)

Clematis L. (clematis, virgin's bower)

A small amount of charred clematis charcoal was found in occupation debris from U.L. 30 in 24N67E (Zone 99). Two species are known in our region; white clematis (*C. ligusticifolia*), however, is locally abundant, and useful as a textile in flexible constructions (Turner et al. 1980:117).

ROSACEAE (Rose Family)

Amelanchier alnifolia Nutt. (serviceberry, saskatoon)

A trace of serviceberry wood and a complete charred seed were taken from two Kartar Phase samples. The seed was found in U.L. 210 in 24N67E among three kinds of conifer wood and burned and unburned shell and bone. This seed is probably the oldest confirmed edible fruit species in our investigations. Field notes state that turtle bones, presumably carapace fragments, were found near the flotation sample sample.

Purshia tridentata (Pursh) D. C. (bitterbrush, greasewood)

At 0.40 g in 49% of the flotation samples, bitterbrush is the most important hardwood. It rivals ponderosa pine as the most important plant species over time, but probably does not exceed it. An unspecified amount of the yellow pine taxon is ponderosa just as some of the Rosaceae taxon is bitterbrush charcoal. The former category, however, is much larger and would contain enough ponderosa pine to keep it in first place at 45-OK-11.

The incidence of bitterbrush increases over time. For example, bitterbrush charcoal is found in 29% of the Kartar flotation samples and in 82% of the Hudnut samples. Wood weight increased tenfold as well. The wood of bitterbrush apparently was not utilized for tools or other items of manufacture; it was, however, used as fuel (Turner et al. 1980:128). We assume that bitterbrush was a principal fuel species at 45-OK-11 and became particularly important during Hudnut times. During this same time span some conifers apparently declined in importance. Ponderosa pine is a case in point. Found in 43% of the Kartar and 29% of Hudnut samples, it showed a fourfold decrease in wood weight over time.

Serviceberry/Hawthorn

Small pieces of serviceberry and hawthorn (Crataegus spp.) can be difficult to distinguish. These are placed in the serv/haw taxon, the second most important category among the hardwoods.

Like bitterbrush, this unit shows increase in frequency and weight from Kartar to Hudnut times. All pieces in this taxon are fully charred.

Other Rosaceae

Five Kartar Phase flotation samples contained charcoal that needs further identification. Most of these appear to be samples of rose family woods noted before, such as hawthorn, serviceberry, and bitterbrush.

Finally, six charred seeds have been assigned to this family. A minimum number of five achenes were extracted from Zone 99 flotation sample from 24N67E. They resemble small, immature bitterbrush seeds, and were found with a fragmentary panic grass seed. The sixth seed is from U.L. 180 in 54N72E. It is incomplete and about 1 mm long and 0.7 mm thick with obscure surface roughening. The seed is probably from wild strawberry (*Fragaria* sp.) and bits of fruit-like tissue from the same flotation sample may be strawberry as well. Two species of strawberries were gathered in the past (*F. vesca*, and *F. virginiana*) in May and June (Turner et al. 1980:125). Size and shape of the seeds of the two species are similar (Montgomery, 1977:178) and no distinction can be made from one partial charred seed. Wild strawberries presently grow most abundantly in the mountains under ponderosa pine and mixed coniferous forests above 800 m (2,600 ft).

UNIDENTIFIED SEEDS AND OTHER TISSUE

One largely entire seed from Hearth Feature A in 54N72E remains unassigned to any taxon. Elliptical in shape, it is 3.5 mm long x 1.5 mm broad, planoconvex in cross section and surrounded by a narrow wing or flange. The surface is smooth.

Parts of seed coats, found in three Kartar flotation sample samples from U.L. 180 in 24N67E, U.L. 170 in 54N72E, and in U.L. 80 in 84N73E, are too small to identify further. Two were accompanied by traces of charred tissue thought to have come from fleshy, edible fruits.

Finally, two samples of dense tissue which resembles hawthorn (*Crataegus* sp.) seeds, but which could not be positively identified, was placed in the residual category (Non-Woody Other Tissue). The fiber in Table 5-1 may be animal sinew.

SUMMARY BY COMPONENT

Botanical materials from 45-OK-11 are summarized by component, with discussion of specific areas within components. The discussion begins with the oldest phase.

KARTAR PHASE

The Kartar Phase is represented by 34 flotation samples taken from 6.5 kg of sediment and 17 flotation samples given cursory examination for important taxa. The average carbon ratio of the soil for the 35 flotation samples at 0.3% is from occupation debris associated with Occupation Surface A (24N67E), 3 (54N72E), and 1 (84N73E). Carbon purity ratios averaged 28%, a relatively low rate due to a great amount of non-botanical cultural material in the flotation samples. For example, 66% of the samples contained mammal bone, 63%

had shell, 51% had fish bone, and 23% of the flotation samples contained red or orange pigment lumps.

The Kartar assemblage consists of 83% conifer, 6% hardwood, 2% edible material, and 9% herbaceous material by weight (Table 5-1). All flotation samples have conifer charcoal, and three-fourths have two or more coniferous genera. The major taxa include yellow pine, ponderosa pine, Douglas fir, and larch. Pine appears in 61% of the flotation samples while Douglas fir appears in 46%. Larch occurs in a little less than one-third of the flotation samples.

Hardwoods, by contrast, appear in half the samples and weigh very little as a group. Only two flotation samples contain more than one kind of hardwood charcoal. Bitterbrush is the most important wood, and sage is absent although it grows on the site today.

We have previously explored the reasons for this sharp contrast between the use of these two kinds of wood by the site's early inhabitants. It is rare to find a botanical assemblage in the project area which has so little hardwood, or one in which the herbaceous material outweighs one of the major wood categories.

Kartar Phase edible material is represented by two charred goosefoot seeds (species unknown) from shell concentrations in 24N67E and 54N72E, a serviceberry seed from U.L. 210 in 24N67E, a probable strawberry seed and fruit tissue from the bottom of 54N72E, and six examples of seed coat and fruit tissue from scattered unit levels in all three testing units. The serviceberry and strawberry material are from unit levels which may be from 5000 B.P. or older. Two of the 17 additional flotation samples contained edible material--a flotation sample from a possible Hearth (Feature 96) associated with Lower Housepit 1 contained a goosefoot seed (species unknown), and the floor of Upper Housepit 1 had pieces of charred Lomatium tissue.

The assemblage also contained traces of small-stemmed grass from Block Area 2 living floor and portions of rye grass stem and leaves from Upper Housepit 1 in one of the perused flotation samples. A fragment of fiber or sinew thread was found in occupation debris in Upper Housepit 1, and a fragment of bark believed to be birch was found in prehousepit layers in 84N73E.

Considering most of the flotation sample samples contained so little soil (under 100 grams), the flotation samples are remarkably productive. About one in three contained material, and over half contained three or more species of wood. Grass and herbaceous material are present in nearly all flotation samples and preservation is generally good for samples so old. The scarcity of hardwoods in Kartar samples is not the result of poor preservation.

Since each testing phase unit contains material from separate structures, we will examine each unit separately.

Test Unit 24N67E (Occupation Surface A)

Thirteen flotation samples, assigned to the Kartar Component, were examined from this unit. It intersects a dense occupation surface that is a continuation of Occupation Surface A (see Chapter 6), although the test unit was not included in the feature analysis. Approximately 0.26 g of archaeobotanical materials were identified from 1.7 kg of sediment with an average carbon ratio of 0.4%. At 22%, sample purity was low because of large amounts of non-botanical cultural material in the flotation samples. Fully 92% of the samples contained mammal bone, 75% contained shell and 50% contained fish bone. Four samples had small lithic flakes and one contained red-orange pigment.

The unit assemblage consists of 68% conifer, 5% hardwood, 2% edible material and 8% herbaceous material by weight. Yellow pine weighs most, but the most common wood based on number of appearances is Douglas fir in 77% of the samples. Larch, conifer bark, and pitch appear in about half of the samples. Bitterbrush is the most common hardwood present, but at 0.01 g in four flotation samples, it is not abundant. Three flotation samples contain serviceberry and serv/haw charcoal. Birch appears in one. Hardwoods appear in seven of the 13 samples.

Edible material consists of traces of charred tissue in three flotation samples, a charred goosefoot seed, and an entire serviceberry seed in U.L. 210. Field notes indicate that "turtle" bones were taken from unit level material at or about this elevation. Grass was present in one sample. Birch bark appeared in U.L. 150. Herbaceous material was present in nearly every flotation sample.

Field notes indicate the presence of an occupation layer and a shell concentration from U.L. 150 to 170, which is a continuation of Occupation Surface A defined for adjacent salvage units. Botanical samples from U.L. 140 to 170 have carbon ratios of about 0.6% on the average, and botanical remains indicative of occupation debris. The goosefoot seed, two samples of edible tissue, and the birch bark are from these levels.

Test Unit 54N72E (Housepit 3)

Housepit 3, with a radiocarbon date of 5109±154, is the oldest dated housepit at 45-OK-11. Test Unit 54N72E was excavated in its southeastern periphery, and apparently intersects the floor.

Eight flotation samples from 54N72E (the sample from U.L. 160 was not available for study) are assigned to the Kartar Component flotation samples. The botanical assemblage is represented by 0.25 g of charcoal taken from 3.3 kg of sediment with an average carbon ratio of 0.2%. At 34%, sample purity is highest of the three test units. But non-botanical cultural material is abundantly present--bone and shell appear in 75%, fish and pigment appear in 50%, and lithic flakes appear in 25% of the samples. Pigment-stained quartzite grains also appear in one sample containing pigment lumps.

The botanical assemblage consists of 76% conifer, 16% hardwood, 4% edible material, and 4% herbaceous tissue. Ponderosa pine is the most important wood by weight at 0.13 g. Bitterbrush appears in one more sample than the pine, but it weighs only 0.02 g. Yellow pine appears in five, Douglas fir in four, and larch and conifer pitch appear in three samples each. A trace of juniper appears in one flotation sample. Small amounts of serv/haw and other rosaceae appear in five of the eight flotation samples.

Edible material consists of charred tissue from two flotation samples, a small goosefoot seed, and a probable seed, and charred tissue from wild strawberry from U.L. 180.

Midden debris is heavy from unit levels 100 through 130. These levels probably correspond to the housepit floor, which was encountered at U.L. 120 in 60N68E. Field notes describe dense charcoal staining in U.L. 100, a possible rodent disturbance in U.L. 110 (a rodent tooth and a carbonized dropping were found in the flotation sample), bone and soil stains from U.L. 110 and 120, and a shell concentration covering the unit at 125 cm b.u.d. The goosefoot seed was recovered from the U.L. 130 flotation sample along with four conifers and bitterbrush charcoal. The sample also contained a great amount of shell fragments, including some which had been burned. The carbon content of this sample, even with the heavy accumulation of shell, is high at 0.8% and probably represents deposited garbage.

Test Unit 84N73E (Housepit 1)

Thirteen flotation samples were analyzed from Test Unit 84N73E, on the northeastern periphery of Housepit 1. All are assigned to the Kartar Phase Component. The assemblage contained 0.32 g of identified remains from 1.5 kg of sediment for an average carbon ratio of 0.3%. The samples had an average carbon purity ratio of about 28%. For comparison, 17 flotation samples from the lower and upper Housepit 1 floors (Features 31, 101) were examined but not quantified. Table 5-2 shows the assemblage from the Housepit 1 area divided between occupation surfaces contemporaneous with the two housepit floors and prehousepit levels.

The flotation samples from U.L. 60-90 are from occupational debris accumulated outside the rim of Upper Housepit 1 as defined in Chapter 6, but interpreted by the author as contemporaneous activities closely associated with the housepit. Nine flotation samples from U.L. 100 to 180 are outside, but contemporaneous with, the Lower Housepit 1 floor dated by three radiocarbon dates: 4719±150 B.P., 4808±130 B.P., and 5047±249 B.P. The five lowest flotation samples (U.L. 140-180) correlate with prehousepit levels.

The botanical assemblage consists of 90% conifer, mostly pine, less than 1% hardwood, less than 1% edible material, and 9% herbaceous material. Material noted from two of the 17 perused flotation samples would raise the edible material to 1%. Only three flotation samples contain hardwoods. None of the flotation samples from pre-housepit layers contains hardwood.

Table 5-2. Botanical assemblage from 84N73E, Housepit 1, by weight (g) and number of appearances (#), Kartar Phase, 45-OK-11.

Assemblage	Unit Levels						Total[1]	
	Upper Housepit 1 Occupation (N=4)		Lower Housepit 1 Occupation (N=4)		Pre-Housepit Occupation (N=5)			
	g	#	g	#	g	#	g	#
Conifer (90%)								
Lodgepole pine	–	–	–	–	0.02	1	0.02	1
Ponderosa pine	0.01	1	0.05	3	0.06	2	0.12	6
Yellow pine	0.02	4	0.04	3	0.02	2	0.08	9
Douglas fir	0.01	1	-0.01	1	–	–	0.01	2
Larch	–	–	0.01	1	–	–	0.01	1
Pinaceae	0.01	2	–	–	–	–	0.01	2
Juniper	–	–	-0.01	1	–	–	-0.01	1
Bark	–	–	-0.01	2	-0.01	1	-0.01	3
Pitch	-0.01	1	0.01	2	-0.01	1	0.01	4
Other	-0.01	1	0.03	3	-0.01	1	0.03	5
Hardwood (-1%)								
Rosaceae	-0.01	1	-0.01	1	–	–	-0.01	2
Mock orange	-0.01	1	–	–	–	–	-0.01	1
Edible Material (-1%)								
Tissue	-0.01	1	–	–	–	–	-0.01	1
Other Tissue (9%)								
Grass	-0.01	1	–	–	-0.01	2	-0.01	4
Herbaceous stem	0.01	4	-0.01	1	0.02	5	0.03	10
Unknown[2]	-0.01	1	-0.01	1	-0.01	1	-0.01	3
Total	0.06		0.14		0.12		0.32	

[1] Lomatium and ryegrass tissue from Upper Housepit 1 floor, and goosefoot seed from Lower Housepit 1 floor have not been added to totals.

[2] Two samples have possible nut hull material.

Edible material includes a trace of charred tissue from the Upper Housepit floor as well as a sample of *Lomatium* sp. root from one of the 17 additional flotation samples. A charred goosefoot seed was noted in a hearthlike feature (Feature 96) on the Lower Housepit floor in another of the additional flotation samples. A trace of small stemmed grass (stem diameter about 1 mm) was noted from two flotation samples, and rye grass (*Elymus* sp.) was identified from one of the perused samples. The rye grass, lomatium tissue and chenopod seeds do not appear in Table 5-1, as they are not from standard subsamples. Bits of herbaceous tissue appear in most flotation samples from Upper Housepit and pre-housepit unit levels and indicate preservation is generally good. Finally a flotation sample from Upper Housepit 1 and pre-housepit layers contain tissue which is probably hawthorn (*Crataegus* sp.) seed fragments.

Non-botanical cultural materials are found in the flotation samples: fish bone in 69%, shell in 46%, mammal bone in 31%, and pigment in 38% of the samples. One contained a lithic flake. Three samples from the housepit layers contain burnt soil particles as well. Shell is most abundant in the Lower Housepit 1 samples. None was noted from the upper samples. Much of the fish and bone shows signs of burning; burnt shell is noted from pre-housepit unit levels. Nearly every flotation sample contains evidence of bioturbation; most of this evidence is in the form of insect remains, an unsurprising fact given the organic remains in the sediments. Upper Housepit 1 flotation samples have fewer insect remains than other flotation samples. The heaviest shell contamination is from U.L. 110, which proably represents part of the shell layer of "pavement" noted in Lower Housepit 1. Pigment is found scattered through the unit levels. U.L. 60 and 70 have the heaviest concentration. Field notes describe a large piece of it associated with grinding stones in U.L. 70-80. As in 54N72E, the assemblage appears to be deposited garbage, perhaps discards from hearth-related tasks.

HUDNUT PHASE

The Hudnut Phase is represented by 15 unit level and two Feature A flotation samples associated with an age of 3557±523 B.P. Approximately 0.66 g of archaeobotanical material were identified from 7.5 kg of sediment for an average carbon ratio of 1.0%. Purity ratings varied from less than 1% in testing phase unit 84N73E to 99% in Feature A from 54N72E, with an average of 47%. Nearly all the botanical material is from testing phase units 24N67E and 54N72E. Unit 84N73E, productive of botanical fragments at lower levels, yielded only a trace of conifer charcoal and grass from three Hudnut flotation samples.

The zonal assemblage (Table 5-1) shows some change over the previous Kartar Phase assemblage in wood relationships. The assemblage consists of 40% conifer charcoal, 53% hardwood, 2% edible material and 5% nonwoody herbaceous material. The high ratio of hardwoods to conifer reveals the character of that change. The most common wood is bitterbrush, identified in 82% of the flotation samples. Sage is found in small amounts. Yellow pine is found in as many flotation samples as bitterbrush, but in smaller amounts. Woods which show little if any change consist of larch, Douglas fir, juniper, serviceberry or hawthorn, and a trace of birch. Some larch as well as the birch is partially carbonized.

Edible tissue consists of seed fragments: a minimum of two goosefoot seeds (probably C. fremontii) from U.L. 90 in 54N72E, and bits of possible fruit seed wall from two unit levels associated with Feature A. Nonedible seeds are present in 24N67E and consist of at least five bitterbrush seeds from three unit levels in 24N67E; and three grass florets, and an unknown seed in Feature A. The edible species indicate fall or later summer occupation, while the grass and bitterbrush seeds suggest mid-summer occupation.

Finally, a tiny fragment of charred and twisted cordage-like material was found in Feature A. It is identical to fragments found from Analytic Zone 2 occupation at 45-OK-2 with a date of 1112±95 B.P. (B-4275) (Campbell 1984b). The material may be charred sinew thread.

Except for shell, the Hudnut flotation samples contained even more non-botanical cultural material than the Kartar flotation samples. Materials observed include bone in 94%, lithic flakes in 89%, fish and pigment in 83% each, and shell in 33% of the samples. Though insect parts and a few rodent remains occur in many of the flotation samples, they are a minor contaminant.

Feature A is an oval fire hearth, 60 cm by 40 cm wide and approximately 20 cm deep, in 54N72E. Field notes indicate the presence of charcoal, fire-modified rock, bone and lithic flakes. Charcoal was dated to about 3,500 years ago. Two flotation samples from the hearth are 99% bitterbrush charcoal with traces of yellow pine, larch and conifer cone bits. Three partial grass florets and a tiny unknown seed were identified from the top of the hearth. Burnt bone, fire-modified flakes, and red-orange pigment lumps were also found in the samples. The pigment appears to be similar to a large lump of ocher found outside the hearth periphery by the excavators.

Unit level flotation samples taken within 25 cm of the feature flotation samples have more kinds of charred botanical material indicative of occupation debris. Those likely associated with the hearth are from unit levels 40, 50 and perhaps 60 cm b.u.d. Carbon ratios are high--from 0.7 to 1.1% and purity levels are moderate at from 40%-50%, reflecting the presence of many pigments lumps, pigment-stained quartzite grains, tiny lithic flakes and fish and mammal bones. Conifer species are equal to hardwood in weight and far exceed them in number. Bitterbrush is the only hardwood. The conifer category contains yellow pine, larch, Douglas fir, juniper, pitch, other cypress family wood, and other conifer wood. Charred cordage or sinew and a fragment of an unidentified seed coat is present. The assemblage is representative of occupation debris; its position outside housepits would indicate that it is deposited rubbish or camp debris.

UNASSIGNED MATERIALS

Five flotation samples from the upper 30 cm of three testing phase units could not be assigned to zone. The material, shown in Table 5-1, consists of only 0.09 g of floral charcoal taken from 736 g of sediment, for an average carbon ratio of 0.3 and an average purity rating of 22%. Test Unit 84N72E contributed almost no carbonaceous material to the total. The small assemblage consists of 22% conifer, mostly yellow pine, and 56% hardwood. Conifers present include ponderosa pine, larch, and Douglas fir along with a trace of conifer bark. The most common hardwood is bitterbrush charcoal found in four of five samples. A small amount of charred clematis vine wood is also present, as well as a small twig end which is probably sage. No edible materials were identified from the flotation samples. Seeds are present, and five immature bitterbrush seeds, as well as part of a grass floret (Panicum or Paspalum sp.) were taken from U.L. 30 in 24N67E. The seeds are indicative of summer occupation. Seed material and herbaceous tissue contribute 22% of the assemblage weight. Non-botanical materials from the flotation samples include lithic flakes and mammal bone from four flotation samples, fish fragments from three, and shell bits from one flotation sample. No features were noted, and no radiocarbon dates were available for these levels. The botanical assemblage as well as the non-botanical materials resemble Hudnut material.

6. FEATURES

During excavations at 45-OK-11, 209 features were identified in the field. Some of these represented natural strata and are not considered in feature analysis. Others were found to be redundant and combined, or inconsequential and discarded. The cultural features which remained were classified according to a two-tiered paradigmatic classification (described in Campbell 1984d) which considers, on the one level, feature boundaries, provenience, shape and patterning; and, on the second level, the abundance of material contents. By combining the information of the paradigmatic classes with information on size and actual material counts, we then classified the features into functional types. These functional types are broadly defined as housepits, firepits, other pits, exterior occupation surfaces, and debris scatters. These, in turn, may be further subdivided, as they are in the second half of this chapter.

Formal feature analysis was begun and completed in the summer of 1983; excavations began at 45-OK-11 in the summer of 1978. Our interpretations here are based on data recorded in unit level notes, daily site summaries, stratigraphic profiles and photographs. Our perspective is site-wide, unlike the excavators' perspective which was generally confined to the 2 x 2-m unit. Therefore, the interpretation of cultural features here may differ from previously preliminary reports. It should be apparent that our definition of cultural features is a conservative measure of site structure: nothing but field assigned features are considered. We lacked the time to reassess all excavation notes for unfeatured surfaces or concentrations. By no coincidence, most cultural features recorded in the field had very obvious boundaries or massive structural elements. For example, in the fill of Upper Housepit 1 the only features recorded are some small pits and a long, thin shell scatter atop a poorly defined activity surface. Yet, we know that the fill contained a dense accumulation of cultural material, which was not a mass of undifferentiated debris, since field notes record numerous lenses with discrete clusters of artfacts.

Two cultural components have been identified at 45-OK-11. The first of these is a large Kartar Phase housepit settlement dating from around 5400-4200 B.P.; the younger component is a series of open camps dating to the Hudnut Phase, around 3900-2800 B.P. The cultural features of each component are discussed in detail below, by component, area, and analytic zone. Information on the provenience and contents of individual features can be found in Tables D-1 through D-5, Appendix D. The tables accompanying the text summarize content information by feature type.

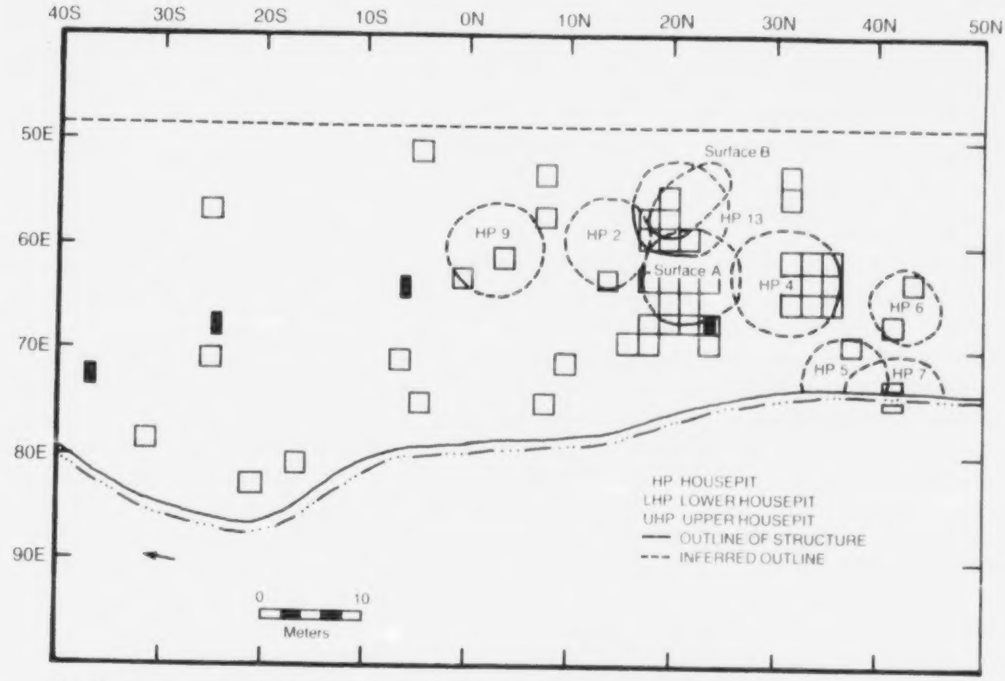

40S
30S
20S
10S
0N
10N
20N
30N
40N
50N
50E
60E
70E
80E
90E
Surface B
HP 13
HP 9
HP 2
Surface A
HP 4
HP 6
HP 5
HP 7
HP HOUSEPIT
LHP LOWER HOUSEPIT
UHP UPPER HOUSEPIT
OUTLINE OF STRUCTURE
INFERRED OUTLINE
0
10
Meters

Figure 6-1. Location of housepits and major occupation surfaces, Kartar Component, 45-OK-11.

THE KARTAR COMPONENT

The earliest cultural component at 45-OK-11 is a complex, stratified record of exterior use surfaces, bone concentrations, middens, and housepits. At least 11 housepits were identified in the field, all dating to 5100-4200 B.P. Radiocarbon dates suggest that three to five housepits may have been occupied contemporaneously, while stratigraphic records chronicle rapid use and reuse of housepits, housepit depressions, and exterior surfaces. These housepits indicate a semipermanent occupation, possibly even a village that was established along the Columbia River at 45-OK-11 around 5,000 years ago. Figure 6-1 shows the known and postulated boundaries of the housepits and major occupation surfaces.

Kartar Phase cultural features are found in all eight analytic areas identified at 45-OK-11 (see Chapter 2). All of the area deposits have been subdivided into analytic zones, which we will use to organize our discussion of features into a temporal sequence. The features themselves also suggest temporal succession. The contents of features are summarized by type in Tables 6-1, 6-2, 6-3, and 6-4. Information on contents of individual features may be found in Appendix D, Tables D-1 through D-5.

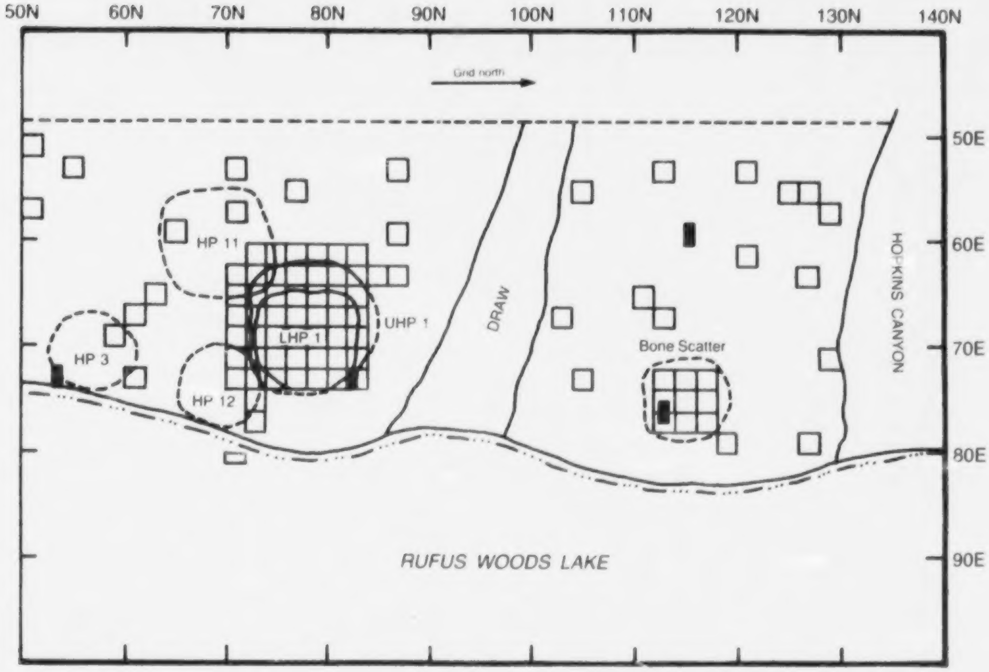

50N
60N
70N
80N
90N
100N
110N
120N
130N
140N
Grid north
50E
60E
70E
80E
90E
HP 11
HP 3
HP 12
LHP 1
UHP 1
DRAW
Bone Scatter
HOPKINS CANYON
RUFUS WOODS LAKE

Figure 6-1. Cont'd.

AREA ONE

Area One includes all excavation units at the south end of the site which were not part of any major block excavations. Features in Area One are shown in Figure 6-2. Six housepits were partially exposed by random units in Area One. Often only a single 2 x 2-m unit was opened within the housepit. Therefore, size and shape of these housepits are unknown, although possible boundaries are shown on the site map (Figure 6-1). All the housepits are characterized by high percentages of basalt and coarse quartzite lithic debris, by cobble and bone tools, and by the presence of large mammals and fish in the faunal assemblage (Tables 6-1, 6-2, and 6-3). Dimensions and dates of housepits are summarized in Table 6-5.

Housepit 2

A portion of Housepit 2 was exposed in 14N62E, revealing a shell-covered wall which sloped abruptly from east to west. The shell on the wall varied from 7 to 10 cm thick, and began to level out and dissipate approximately 40 cm below its surface of origin. As the wall merged into the floor, the charcoal and charcoal staining below the shell became more and more prevalent, and the sandy matrix became more compact (Figure 6-3). The staining below the

Table 6-1. Average weight and density of bone, shell, and FMR by feature type, 45-OK-11.

Feature Type	Total Volume (m^3)	Bone					Shell[1]				FMR				
		N	Weight (g)	Mean Weight (g)	Density N/m^3	Density g/m^3	N	Weight (g)	Density N/m^3	Density g/m^3	N	Weight (g)	Mean Weight (g)	Density N/m^3	Density g/m^3
KARTAR PHASE															
Housepit floor	27.10	15,955	7,157	0.45	589	264.0	12,470	55,987	460	2,066.0	1,057	203,798	193	39	7,520.0
Housepit wall	18.70	6,825	3,938	0.58	365	210.0	66,527	307,789	3,558	16,459.0	794	117,733	148	42	6,296.0
Housepit fill	185.10	58,146	17,453	0.30	314	94.0	22,300	95,950	120	518.0	1,250	182,416	146	7	985.0
Interior firepit	0.56	294	107	0.36	525	191.0	125	868	223	1,550.0	104	18,211	175	186	32,520.0
Exterior firepit	0.99	151	64	0.42	153	65.0	736	139	743	140.0	79	13,840	175	80	13,980.0
Interior pit	1.45	263	188	0.71	181	130.0	603	4,880	415	3,366.0	15	5,598	373	10	3,860.0
Exterior pit	1.20	80	37	0.46	67	31.0	43	327	36	272.0	12	5,272	439	10	4,393.0
Shell concentration	9.00	3,864	2,449	0.63	429	272.0	42,692	254,751	4,744	28,306.0	537	74,317	138	60	8,257.0
Exterior occupation surface	30.70	31,211	12,567	0.40	1,016	409.0	8,670	32,243	282	1,050.0	791	134,759	170	26	4,390.0
Stain	0.58	6	2	0.33	10	3.5	54	4	93	6.9	-	-	-	-	-
Debris concentration	1.50	283	88	0.31	189	59.0	18	-	12	-	4	520	130	2.7	347.0
Bone concentration	1.70	4,815	7,622	1.58	2,832	4,483.0	307	1,381	181	812.0	39	5,698	146	23	3,352.0
Cultural strata	0.83	217	299	1.38	261	360.0	390	4,153	470	5,004.0	50	9,680	194	60	11,663.0
HUDNUT PHASE															
Exterior firepit	1.12	208	26	0.13	186	23.0	2	5	1.8	4.5	179	81,949	458	160	73,178.0
FMR scatter	3.08	277	44	0.16	90	14.0	9	45	2.9	14.6	490	72,871	149	159	23,659.0
FMR concentration	0.17	5	-	-	29	-	-	-	-	-	50	18,360	367	294	108,000.0
Lithic concentration	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] Mean weight of shell was not calculated because N = number of hinges and weight includes hinges and other shell.

Table 6-2. Material types of lithic debitage by feature type, 45-OK-11.

Feature Type	CCS		Quartzite		Fine-grained quartzite		Granitic		Basalt		Obsidian		Other		Total N	Density N/m^3
	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %		
KARTAR PHASE																
Housepit Floor	775	39	225	13	152	8	13	1	772	39	1	<1	5	<1	1,973	73.0
Housepit Wall	81	5	360	24	129	9	17	1	904	60	2	<1	7	<1	1,500	80.0
Housepit Fill	2,957	42	1,050	17	300	5	60	1	1,942	31	11	<1	15	<1	6,335	34.0
Interior Firepit	41	69	3	5	1	2	-	-	14	24	-	-	-	-	59	105.0
Exterior Firepit	2	67	1	33	-	-	-	-	-	-	-	-	-	-	3	3.0
Interior Pit	5	19	2	7	2	7	-	-	18	67	-	-	-	-	27	19.0
Exterior Pit	9	47	8	42	1	5	-	-	1	5	-	-	-	-	19	15.0
Shell Concentration	67	17	216	54	15	4	1	<1	102	25	-	-	1	<1	402	45.0
Exterior Occupation Surface	1,495	47	1,256	39	41	1	7	-	376	12	6	<1	2	<1	3,183	103.0
Stain	1	50	-	-	1	50	-	-	-	-	-	-	-	-	2	3.5
Debris Concentration	2	33	4	67	-	-	-	-	-	-	-	-	-	-	6	4.0
Bone Concentration	90	72	11	9	6	5	-	-	16	13	-	-	2	2	125	74.0
Cultural Strata	15	54	2	7	-	-	1	14	5	18	-	-	2	7	28	34.0
TOTAL	5,540	41	3,168	23	648	5	102	1	4,150	30	20	<1	34	<1	13,662	-
HUDNUT PHASE																
Exterior Pit	35	60	15	26	1	2	-	-	2	3	-	-	2	3	58	52.0
FMR Scatter	205	75	37	14	3	1	-	-	1	<1	1	<1	1	<1	273	89.0
FMR Concentration	3	100	-	-	-	-	-	-	-	-	-	-	-	-	3	18.0
Lithic Concentration	19	100	-	-	-	-	-	-	-	-	-	-	-	-	19	380.0
TOTAL	262	74	52	15	4	1	-	-	3	1	1	<1	3	1	353	-

Table 6-3. Density of grouped artifact types by feature type, 45-OK-11.

Feature Type	Flake Tool		Points, Blades		Formed Tools		Tabular Knives and Groundstones		Flaked Cobbles		Grindingstones		Bone Tools		Modified Bone		Other		Total	
	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3	N	N/m^3
KARTAR PHASE																				
Housepit Floor	52	1.92	23	0.85	4	0.15	17	0.63	35	1.30	11	0.40	10	0.37	30	1.10	11	0.41	194	7.16
Housepit Wall	6	0.32	10	0.53	1	0.05	21	1.12	25	1.34	3	0.16	4	0.21	7	0.37	11	1.03	88	4.71
Housepit Fill	99	0.53	72	0.39	10	0.05	28	0.15	28	0.15	7	0.04	18	0.10	81	0.44	15	0.08	358	1.93
Interior Firepit	3	5.36			-										2	3.57	3	5.36	8	14.30
Exterior Firepit	-	-	-	-	-	-										-	1	1.01	1	1.01
Interior Pit	1	0.69	1	0.69												-	1	0.69	3	2.07
Exterior Pit	1	0.83	-	-					1	0.83	-			-	1	0.83	-	-	3	2.50
Shell Concentration	5	0.56	3	0.33	1	0.11	10	1.11	8	0.89		-	1	0.11	5	0.56	1	0.11	34	3.78
Exterior Occupation Surface	35	1.14	21	0.68	1	0.03	18	0.59	22	0.72		-	5	0.16	19	0.62	6	0.25	129	4.20
Bone Concentration	4	2.35	2	1.18	1	0.59	7	4.12	2	1.18	1	0.59	2	1.18	2	1.18	1	0.59	22	12.90
Cultural Strata	2	2.40	-	-	-		2	2.40	1	1.20	1	1.20	1	1.20	3	3.60	2	2.41	12	14.50
HUDNUT PHASE																				
Exterior Firepit	1	0.89	1	0.89			2	2.02	-	-	-					-		-	4	3.57
FMR Scatter	4	1.30	2	0.65	2	0.65	2	0.65					1	0.32			1	0.32	12	3.90
Lithic Concentration	2	40.00	-	-	-	-		-	-									-	2	40.00

[1] See Table D-3 for artifact classes included in group.

Table 6-4. Tool types by feature type, 45-OK-11.

Tool Types	Housepit Floor	Housepit Wall	Housepit Fill	Interior Firepit	Exterior Firepit	Interior Pit	Exterior Pit	Shell Concentration	Exterior Living Surface	Bone Concentration	Cultural Strata	FMR Scatter	Lithic Concentration	Total
KARTAR PHASE														
Flakes														
Utilized only	28	3	57	3	-	1	-	2	19	4	-	-	-	117
Unifacially retouched	14	3	25	-	-	-	-	1	6	-	2	-	-	51
Bifacially retouched	10	-	14	-	-	-	1	1	7	-	-	-	-	33
Resharpening flake	-	-	2	-	-	-	-	1	3	-	-	-	-	6
Burin spall	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Points and Blades														
Biface	9	5	35	-	-	-	-	-	12	1	-	-	-	62
Projectile point	3	3	17	-	-	-	-	3	4	-	-	-	-	30
Projectile point base	2	2	9	-	-	-	-	-	1	1	-	-	-	15
Projectile point tip	7	-	10	-	-	1	-	-	4	-	-	-	-	22
Blade	2	-	1	-	-	-	-	-	-	-	-	-	-	3
Formed Stone Tools														
Drill	2	1	1	-	-	-	-	-	-	-	-	-	-	4
Graver	-	-	3	-	-	-	-	1	-	-	-	-	-	4
Burin	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Scraper	2	-	5	-	-	-	-	-	1	1	-	-	-	9
Cores	-	1	2	-	-	-	-	-	4	-	-	-	-	7
Tabular Knives	9	18	17	-	-	-	-	6	15	4	1	-	-	70
Groundstone Tools														
Hammerstone	8	4	9	-	-	-	-	2	3	3	1	-	-	30
Maul	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Pestle	-	1	-	-	-	-	-	-	-					
Edge ground cobble	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Flaked Cobbles														
Chopper	31	23	26	3	-	-	1	7	20	2	1	-	-	114
Peripherally flaked cobble	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Amorphously flaked cobble	3	2	2	-	-	-	-	1	2	-	-	-	-	10

Table 6-4. Cont'd.

Tool Types	Housepit Floor	Housepit Wall	Housepit Fill	Interior Firepit	Exterior Firepit	Interior Pit	Exterior Pit	Shell Concentration	Exterior Living Surface	Bone Concentration	Cultural Strata	FMR Scatter	Lithic Concentration	Total
KARTAR PHASE														
Grinding Stones														
Millingstone	7	3	5	-	-	-	-	-	-	1	1	-	-	17
Hopper mortar	2	-	1	-	-	-	-	-	-	-	-	-	-	3
Anvil stone	2	-	1	-	-	-	-	-	-	-	-	-	-	3
Shaft Abraders	-	1	2	-	-	-	-	-	-	-	-	-	-	3
Beads	1	1	-	-	-	-	-	-	1	1	-	-	-	4
Other														
Shaped/Incised siltstone	1	-	-	-	-	-	-	-	1	-	-	-	-	2
Olivella	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Indeterminate stone	8	7	6	-	-	1	-	-	1	-	2	-	-	25
Indeterminate textile	-	-	-	-	1	-	-	1	-	-	-	-	-	2
Indeterminate bone	1	-	6	-	-	-	-	-	-	-	-	-	-	7
Bone Tools														
Toggle	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Composite harpoon point	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Harpoon point	1	1	-	-	-	-	-	-	1	-	-	-	-	3
Unbarbed harpoon unipoint	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Needle	-	-	2	-	-	-	-	-	-	-	-	-	-	2
Shuttle	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Awl	1	-	2	-	-	-	-	1	1	2	1	-	-	8
Chisel/Adze	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Wedge	5	1	4	-	-	-	-	-	-	-	-	-	-	10
Pendant	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Other	1	1	8	-	-	-	-	-	1	-	-	-	-	11
Modified Bone Fragments														
Articular end, metapodial or longbone shaft	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Pointed bone fragment	1	3	22	-	-	-	-	2	7	2	-	-	-	43
Edged end	1	-	1	-	-	-	-	-	-	-	-	-	-	3
Squared/Round end	-	-	1	-	-	-	-	-	1	-	-	-	-	2

Table 6-4. Cont'd.

Tool Types	Housepit Floor	Housepit Wall	Housepit Fill	Interior Firepit	Exterior Firepit	Interior Pit	Exterior Pit	Shell Concentration	Exterior Living Surface	Bone Concentration	Cultural Strata	FMR Scatter	Lithic Concentration	Total
KARTAR PHASE														
Modified Bone Fragments Cont'd.														
Blunted end	–	–	1	–	–	–	–	–	–	–	–	–	–	1
Flaked long bne shaft	1	1	4	–	–	–	–	–	–	–	–	–	–	5
Other	8	2	14	–	–	–	–	3	5	2	–	–	–	34
Technologically modified only	13	1	38	2	–	–	–	–	5	1	–	–	–	60
TOTAL	194	88	358	8	1	3	3	34	129	22	12	–	–	852
HUDNUT PHASE														
Flakes														
Utilized only	–	–	–	–	–	–	–	–	–	–	–	3	2	5
Unifacially retouched	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Resharpening flake	–	–	–	–	1	–	–	–	–	–	–	–	–	1
Points and Blades														
Biface	–	–	–	–	–	–	–	–	–	–	–	2	–	2
Projectile point tip	–	–	–	–	1	–	–	–	–	–	–	–	–	1
Formed Stone Tools														
Graver	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Scraper	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Tabular Knives	–	–	–	–	1	–	–	–	–	–	–	–	–	1
Groundstone tools														
Hammerstone	–	–	–	–	1	–	–	–	–	–	–	2	–	3
Other														
Indeterminate	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Bone Tools														
Harpoon point	–	–	–	–	–	–	–	–	–	–	–	1	–	1
TOTAL	–	–	–	–	4	–	–	–	–	–	–	12	2	18

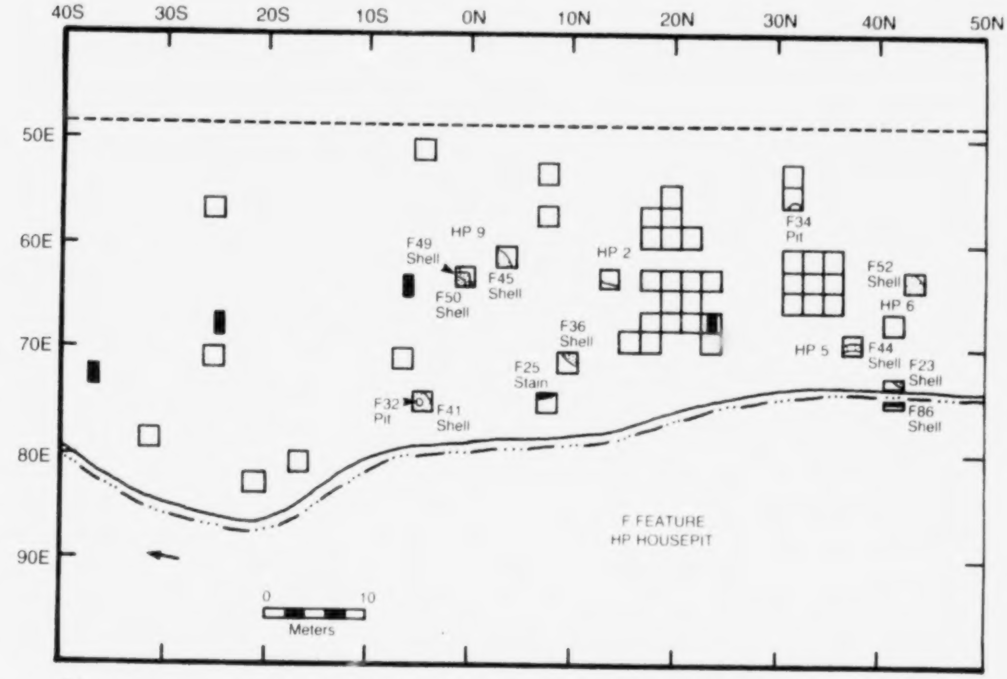

40S
30S
20S
10S
0N
10N
20N
30N
40N
50N
50E
60E
70E
80E
90E
F49 Shell
HP 9
F50 Shell
F45 Shell
HP 2
F34 Pit
F52 Shell
HP 6
F36 Shell
HP 5
F44 Shell
F23 Shell
F25 Stain
F32 Pit
F41 Shell
F86 Shell
F FEATURE
HP HOUSEPIT
0
10
Meters

Figure 6-2. Location of features outside of major block excavations, Kartar Component, 45-OK-11.

shell appears to represent the wall itself, while the shell may be post-occupational debris. Small charred timbers around 4 cm in diameter were recovered directly above this floor; they are dated to 4872±142 B.P. Little bone was found in the wall or on the floor of Housepit 2; shell is the dominant material. A single feature number (Feature 12) was assigned to both the shell-covered wall and the floor; Housepit 2 fill (Feature 750) was collected separately. One would expect to find evidence of Housepit 2 in Area 3 (Figure 6-1). If it existed, however, it may have been destroyed by later occupations (see below).

Housepit 3

In Housepit 3, a compacted living floor (Feature 17) was discovered at 120 cm below unit datum (b.u.d.) in 60N68E; an unfeatured shell layer marked the rim in 62N72E. Although the excavation unit apparently caught the edge of the housepit floor, the wall and rim were obscured by a large shell concentration (Feature 42) in the overlying fill; the depth of the housepit is, therefore, unknown, but may be around 40 cm. Twenty-six charred timbers were lying horizontally on the floor, in no apparent pattern. The timber fragments were all very short--20 cm or less in length--and from 2-4 cm in diameter. A carbon sample from one of these timbers yielded a date of

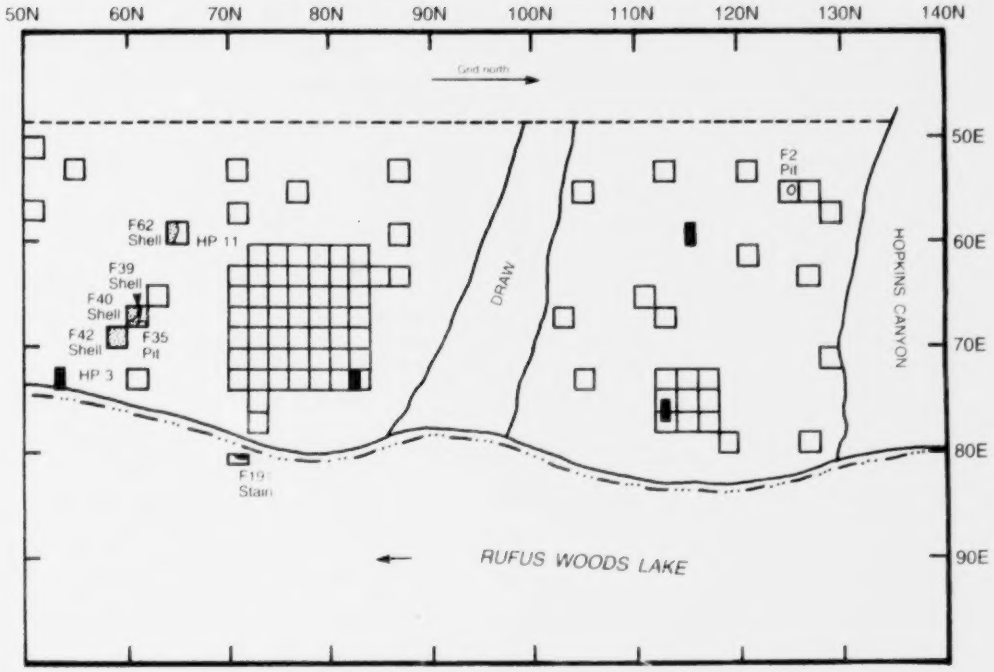

50N
60N
70N
80N
90N
100N
110N
120N
130N
140N
Grid north
50E
60E
70E
80E
90E
F2
Pit
F62
Shell
HP 11
F39
Shell
F40
Shell
F42
Shell
F35
Pit
HP 3
DRAW
HOPKINS CANYON
F19
Stain
RUFUS WOODS LAKE

Figure 6-2. Cont'd.

5109±154 B.P., making Housepit 3 the oldest dated housepit on the site. Since the shell concentration which covers the postulated wall of Housepit 3 also extends partially across the floor, we assume it is post-occupational debris rather than a shell lining. Large numbers of shell also occur in the general fill (Feature 250) above the Housepit 3 floor; a bison bone was recovered from this fill (Table D-5).

Housepit 5

The excavation unit, 38N68E, included only a small corner of Housepit 5, although its northern edge intruded in Housepit 7. A shell stratum (Feature 43) may mark the living floor. Like the lower fill (Feature 301), it contains FMR and lithic tools, while the upper fill (Feature 300) and a later shell lens (Feature 44) contain only shell, bone and lithic debris (compare these four features in Table D-2). The upper shell feature (Feature 44) dates to 4187±206 B.P., providing an upper limit for the date of Housepit 5.

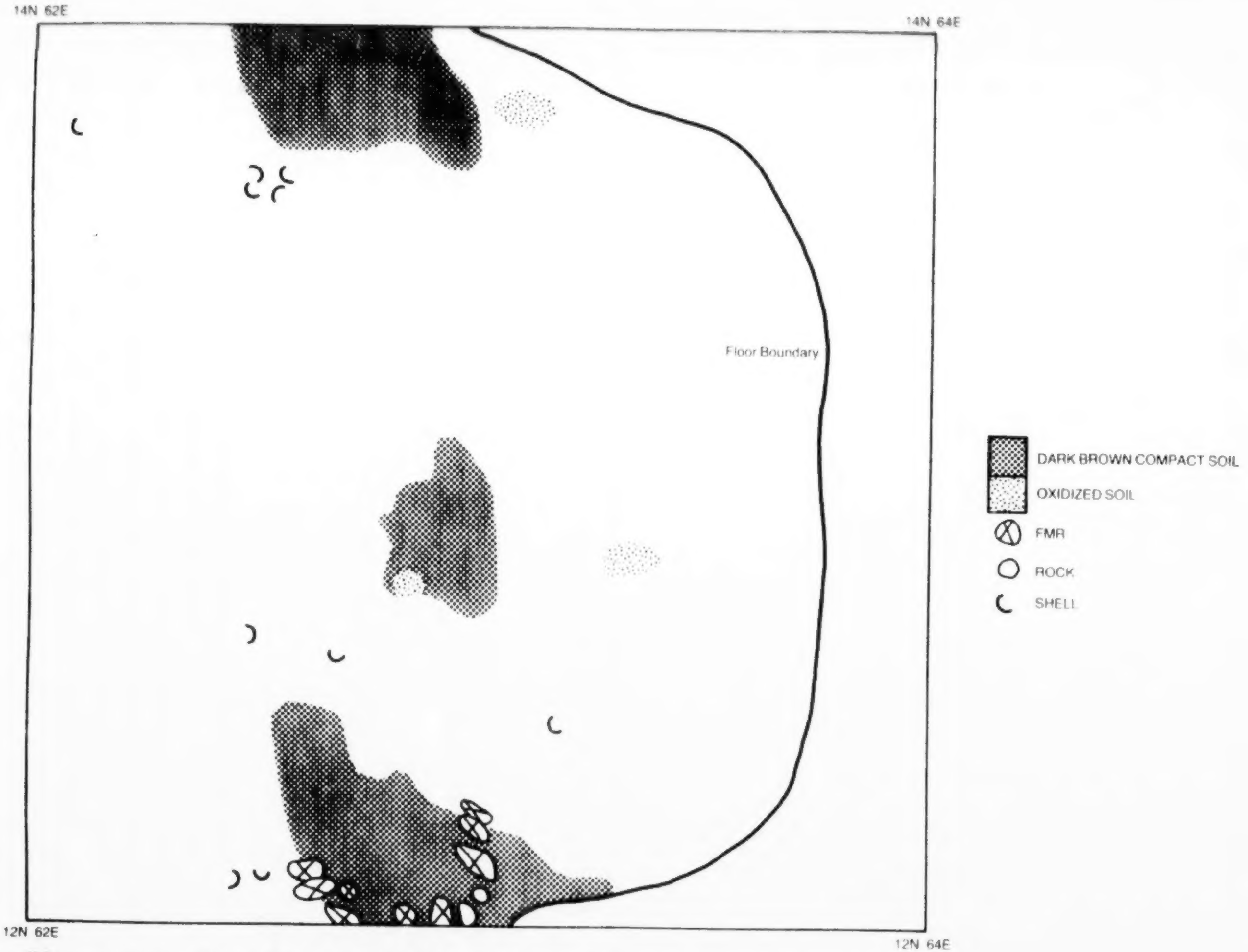

14N 62E
14N 64E
Floor Boundary
12N 62E
12N 64E
DARK BROWN COMPACT SOIL
OXIDIZED SOIL
FMR
ROCK
SHELL

Figure 6-3. Plan map of Housepit 2 Floor (Feature 12), 45-OK-11.

Table 6-5. Dates and dimensions of housepits, 45-OK-11.

Housepit[1]	Dimensions (m)	Depth (cm)	Shape	Dendrocorrected Radiocarbon Date (years B.P.)
Upper Housepit 1	12 x 12 (rim) 7 x 7.5 (floor)	30	Curvilinear	4719±150
Lower Housepit 1	10 x 10 (rim) 10 x 7.5 (floor)	60	Curvilinear	5047±249
Housepit 2	?	40	-	4872±142
Housepit 3	?	40?	-	5109±154
Housepit 4	8-9 diameter (rim)[2]	80	Circular	4565±150
Housepit 5	-	50?	-	4187±206
Housepit 6	At least 6 m diameter[2]	65, 85 (two floors)	-	4757±157
Housepit 7	-	40?	-	-
Housepit 9	-	40	-	-
Housepit 11	10 m diameter[2]	40	Rectilinear?	-
Housepit 12	>8 m diameter[2]	80	Circular?	-
Housepit 13	>8 m diameter[2]	60	-	5171±151[3]

[1] Housepit designations given in the field are maintained. Two housepit numbers (8 and 10) were deleted after further excavation. Housepit 13 was designated by the stratigraphy crew, but was not noted by excavators.

[2] Diameter estimated from portions exposed.

[3] This date may not be reliable.

Housepit 6

In Housepit 6, two living floors were discerned, separated by 20 cm of fill (Feature 402). The lower floor (Feature 403) is dated to 4757±157 B.P. Eight groups of carefully stacked shell (Feature 21) were found on the lower floor (see Plate 22; Salo and Munsell 1979). The second, younger floor (Feature 401) is very similar to the first in terms of the types and quantity of material recovered. Shell lined the wall (Feature 52) of this housepit, although not enough of the wall was exposed to determine whether the shell was refuse or deliberately laid against the wall.

Housepit 7

Housepit 7 was partially exposed prior to excavation in the cutbank along the river; nearly half of the housepit had been eroded away. No floor was identified separately; floor materials are apparently combined with fill material (Feature 500). A large shell midden (Features 23 and 86) within the fill is perhaps associated with an occupation in nearby Housepits 5 or 6.

Otherwise, the house fill contains bone almost exclusively, including a fragment of a human skull.

Housepit 9

Housepit 9 was exposed in two 2 x 2-m units, its southwest corner exposed in 0S62E. Its steeply sloping wall gave way to a compacted sand floor (Feature 51) containing patches of charcoal staining, oxidized soil, and scattered debris. A radiocarbon sample from this surface dates Housepit 9 to 4680±165 B.P. A possible hearth area (Feature 26) was identified separately in 4N60E. Three shell strata occurred above Housepit 9. The first (Feature 50) seems to mark the surface of origin and rim of the housepit. The second (Feature 45) was in the fill above the postulated hearth area. The youngest shell feature (Feature 49) occurred above the housepit rim (Figure 6-2).

Other Features in Area One

Outside the housepits and the features in their fill, 14 other cultural features were recorded in Area One (Figure 6-2). Half of these are thick shell strata or middens. All are quite large, often covering the 2 x 2-m excavation unit in which they were exposed, and all slope to the south and east, apparently following natural contours. There are several instances of superposition of distinct shell layers, or shell and other features, both above and outside of housepits (Figure 6-2).

Bounded stains and pits make up the rest of the features in Area One. The areas of staining include a long, possibly circular area of burned, reddened sand and charcoal in 8N74E (Feature 25), and a 10-cm thick charcoal lens, 50-60 cm long, in 72N79.6E (Feature 191). According to supervisor's notes, the latter may be associated with an occupation noted below Lower Housepit 1. Neither feature contained much material (Table D-2). They are probably remnants of exterior firepits.

A well-defined firepit (Feature 32) is one of three pits recorded in Area One. Roughly circular (75 cm in diameter and 24 cm deep), the firepit is a concentrated area of charcoal, ash, and burned sand. It originated at the top of one of the large shell concentrations (Feature 41) in 4S74E. A second pit (Feature 34) also may have been a firepit; its fill consisted entirely of a charcoal-stained silty sand, with very little cultural material. The pit was large, although only part of it was exposed (a 110 x 40 x 30-cm area). The third pit (Feature 35) underlying two succeeding shell strata (Features 39 and 40) in 62N66E. Also, this is a circular pit, bowl-shaped in profile. Although the pit probably was around 50 cm deep, only the last 10 cm were recognized and excavated separately. It also may also have been a firepit as it contained a cluster of FMR, charcoal, and fire-reddened matrix. Unlike other pits, it yielded a fair number of artifacts, including worked stone and bone (Tables D-3 and D-4).

AREA TWO

The Kartar Phase occupation of Area Two, a block excavation near the center of the site, is represented by a complex succession of midden and occupation surfaces. All of these features are within a single analytic zone (Zone 24); Zones 23 and 25 also encompass Kartar Phase deposits, but contain no cultural features. None of the surfaces extend completely across the entire block, and most of them cannot be identified separately in stratigraphic profiles (Figure 6-4). A gross, two-stage divison of upper and lower deposits is possible (190-200 cm b.u.d. is a rough dividing line between them). These will be referred to as the Upper and Lower Kartar components. Within each of these, superposition of features within individual excavation units permits finer divisions. Figure 6-5 shows the location of these surfaces.

Lower Kartar Component, Area Two

By far the largest of the occupation surfaces in Area Two is in the lower Kartar deposits. This surface (Occupation Surface A) consists of a peripheral zone (most often recorded as Feature 155) and a central zone (Features 169, 159). Both zones were distinguished by augmented material counts and charcoal staining, but the central zone was more intensely stained, by both charcoal and fire, and was compacted enough from use to form a very shallow depression (Figures 6-4 and 6-5). The outer rim of this occupation surface is about 7 m across. (Occupation Surface A should also appear in Area 3 excavations. See discussion under Zone 35, Area 3). The oval central portion is about 3 x 2 m; thickness for both sections varies from 10-20 cm. As might be expected, material density is higher for the periphery than for the central zone where most of the activity would have taken place and from which unhandy debris would have been tossed. A radiocarbon date of 4770±150 B.P. was taken from the peripheral zone. This patterning of debris is similar to that found in deeper housepits, and the occurrence of this surface within a shallow depression also suggests a structure. It may be that some of these surfaces (see Occupation Surface B) are the remains of surface dwellings on temporary constructions like a windbreak or ramada.

Two possible firepits are recorded within or near the central zone. The first (Feature 167) contains some burned soil, ash, and burned shell. It is circular (about 50 cm in diameter) and conical in profile (18 cm deep). The other, larger firepit (Features 161, 162) is slightly upslope from the first, just south of the central portion of the living surface. Like the first, its major constituent is shell, although FMR are also recorded in large number. Dimensions of the second firepit are approximately 100 x 80 x 22 cm. The density of shell in the two firepits, far greater than that of the occupation surface itself, suggests they were used to cook shellfish.

Two other occupation surfaces were recorded in 20N66E which are in uncertain association with Occupation Surface A. The first (Feature 47) is on the same level and slope as the peripheral zone of the larger occupation surface. However, the density of shell is so much greater in Feature 47 that

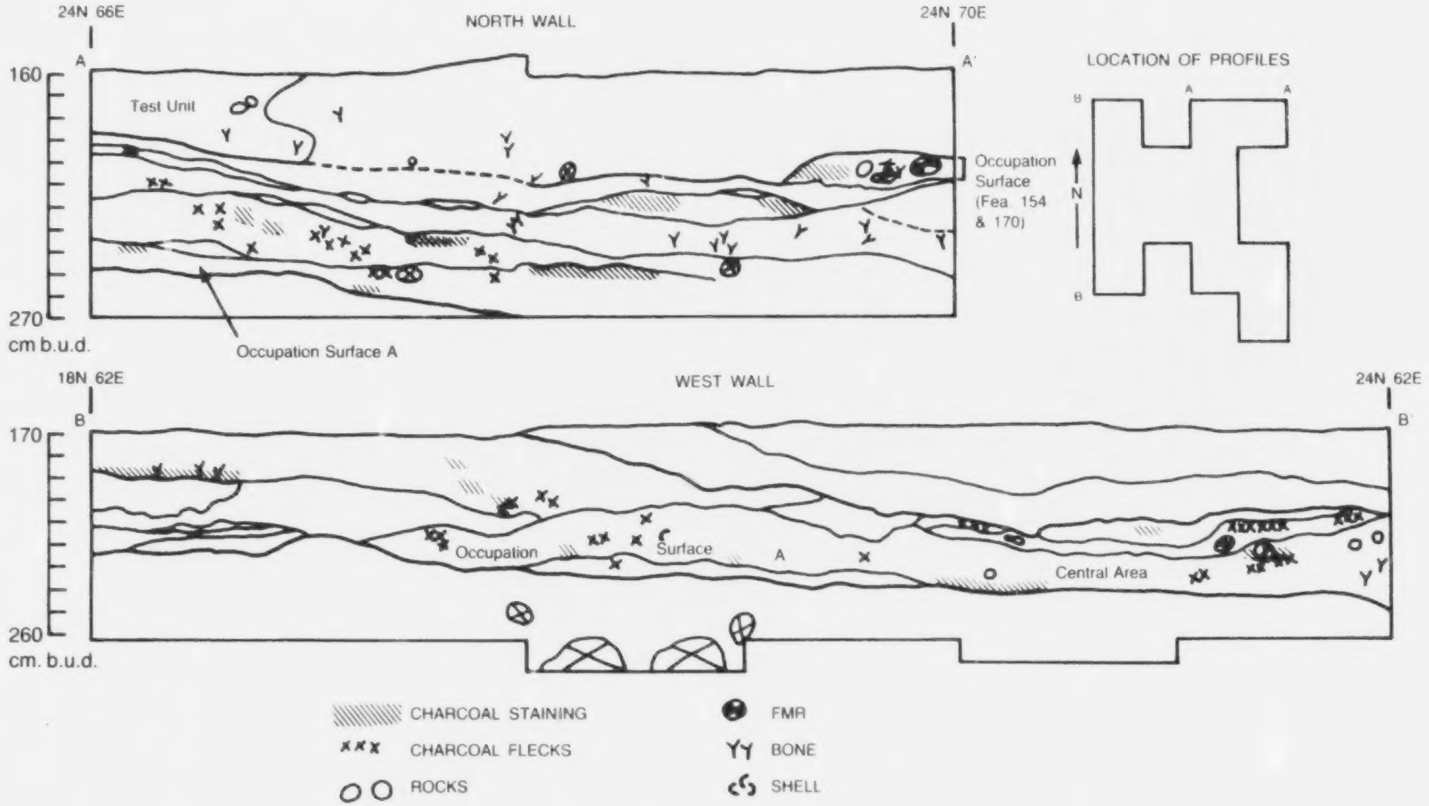

24N 66E
NORTH WALL
24N 70E
A
A'
160
270
cm b.u.d.
Test Unit
Occupation Surface (Fea. 154 & 170)
Occupation Surface A
LOCATION OF PROFILES
A
A
B
B
N
18N 62E
WEST WALL
24N 62E
B
B'
170
260
cm. b.u.d.
Occupation Surface A
Central Area
CHARCOAL STAINING
CHARCOAL FLECKS
ROCKS
FMR
BONE
SHELL

Figure 6-4. Profile of Area 2 showing cross-bedded occupation surfaces, 45-OK-11.

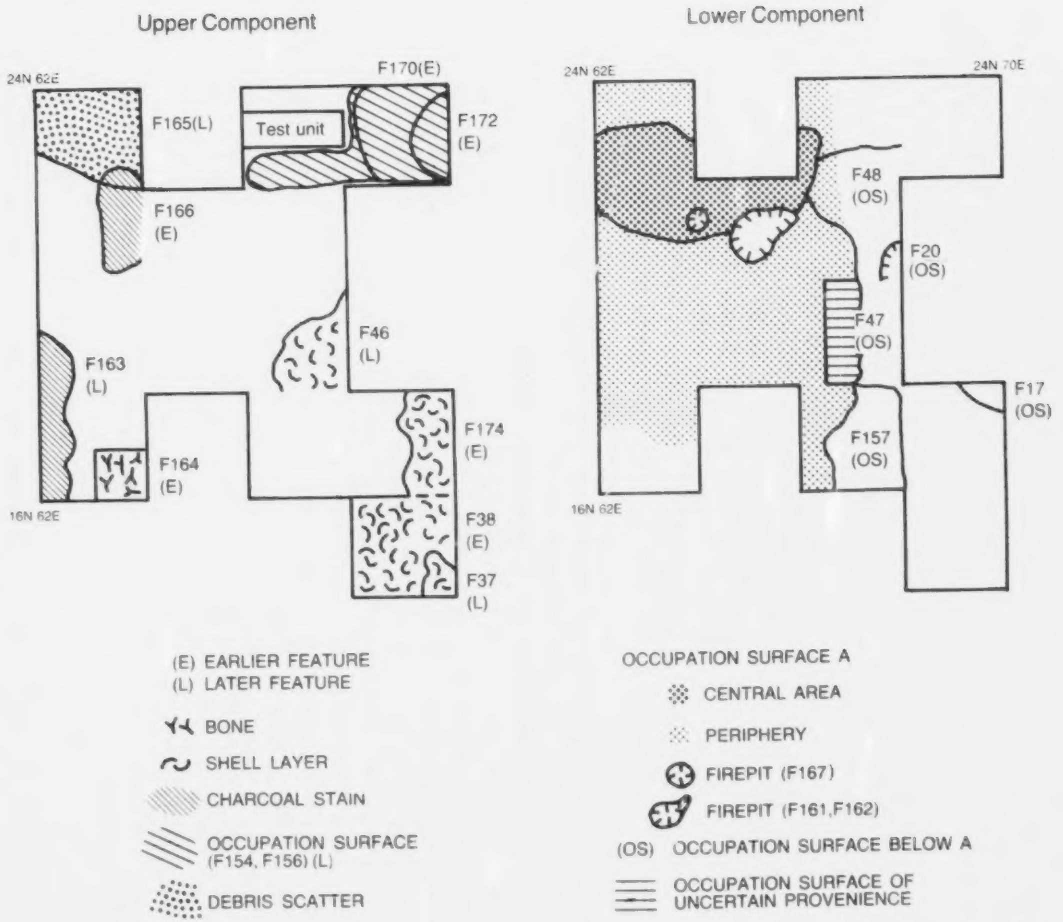

Upper Component
Lower Component
24N 62E
F170(E)
F165(L)
Test unit
F172
(E)
F166
(E)
F46
(L)
F163
(L)
F164
(E)
F174
(E)
16N 62E
F38
(E)
F37
(L)
24N 62E
24N 70E
F48
(OS)
F20
(OS)
F47
(OS)
F17
(OS)
F157
(OS)
16N 62E
(E) EARLIER FEATURE
(L) LATER FEATURE
BONE
SHELL LAYER
CHARCOAL STAIN
OCCUPATION SURFACE (F154, F156) (L)
DEBRIS SCATTER
OCCUPATION SURFACE A
CENTRAL AREA
PERIPHERY
FIREPIT (F167)
FIREPIT (F161,F162)
(OS) OCCUPATION SURFACE BELOW A
OCCUPATION SURFACE OF UNCERTAIN PROVENIENCE

Figure 6-5. Plan map of Upper and Lower Kartar Component features, Area 2, 45-OK-11.

we have kept it separate from Occupation Surface A; content and structure argue that the two are distinct entities, although location and slope suggest otherwise. The second feature (Feature 451), seemingly below Occupation Surface A, is marked by dark charcoal staining and higher densities of bone. It is apparently one of the many use surfaces cross-bedded in Area Two, as shown in Figure 6-4.

Three other occupation surfaces were below the level of Occupation Surface A, often directly overlain by it. The first of these is in 22N66E (Feature 48). Unlike the large surface immediately above it, this feature slopes to the east. Part of a firepit (Feature 20) marked by heavy charcoal staining, burned soil, and ash, was located in the southeast corner of Feature 48. Its dimensions are 84 x 43 x 12 cm. A large bone concentration marks a second occupation surface below Occupation Surface A in 18N66E (Feature 157). Identified bone fragments are almost exclusively deer bone, with virtually no material other than bone recorded. The third and last feature below Occupation Surface A is a small portion of an occupation surface exposed on the east side of the block. Consisting almost solely of shell and charcoal staining, the feature (Feature 177) may be the corner of a midden.

Upper Kartar Component, Area Two

The upper levels of the Kartar Phase occupation also contain several occupation surfaces, although they tend to be smaller and less well defined than earlier ones. Except in cases of direct superposition, we have not been able to determine the temporal succession of these surfaces.

In 24N62E, a diffuse scattering of debris (Debris concentration Feature 165) overlies a large, but essentially sterile, charcoal stain (Stain Feature 166). Neither of these are occupation surfaces **per se**, but are evidence of continued activity above Occupation Surface A.

In 27N66E, a large bone concentration (Feature 154) and associated charcoal stain (Feature 156) slope east, while an underlying occupation surface (Features 170, 172) slopes west. Both are use surfaces characterized by charcoal mottling and areas of more intense carbon staining, and by very high numbers of bone fragments and lithic debitage. In this regard, the lower surface (Features 170, 172) has nearly three times the density of bone and debitage as the upper (Features 154, 156) and thirty times that of Occupation Surface A (Table D-2; volume estimates are included so that the density may be compared). Although they were excavated separately in the field and are distinct deposits, these two features are so similar in material content and so closely associated in space that they must represent a single specialized activity area, used repeatedly for the same purpose. Indeed, stratigraphic profiles do not indicate a break between the two (Figure 6-4). The high density of lithic debitage and small bone fragments suggest that these features are midden deposits; but the compact surfaces, charcoal stains, and chopping and cutting tools argue for a primary activity area. If the latter is the case, the processing of deer which had been partly butchered elsewhere is indicated: deer is the dominant species represented (Table D-5), and the mean bone weight is much smaller than, for example, in the bone concentration features in Area Seven.

In 18N62E, a bone concentration (Feature 164) was exposed in a 1 x 1 x 0.1-m area. Few of the bone fragments were identified; five of the six identified pieces are deer-sized. Underlying this bone concentration is a 1 x 3-m area marked by increased charcoal flecking and staining in the sand (Feature 163). Debris counts are not noticeably higher for this area than for unstained areas, but the increase in carbon does indicate more direct cultural modification of the soil. This feature slopes west; only the eastern edge is exposed. It may be part of a midden or cultural stratum.

Shell features are characteristic of the southeast corner of Area Two. The uppermost shell concentration (Feature 46) slopes west. It exhibits an extremely high density of broken mussel shell (estimated at 39,000 g per m^3). The shell is mixed in a sandy deposit with a few bone fragments, FMR, and waste flakes.

The deepest shell concentration is recorded in 18N68E (Feature 174) and 16N68E (Feature 38). Along with the large number of mussel shell fragments, this feature also contains many bone fragments and FMR. It covers a triangular area, 4 x 2 m on a side, and is about 20 cm thick. A small, concentrated area of shell fragments (Feature 37) was exposed above this shell layer.

Area Two, then, during the Kartar occupation of 45-OK-11 was the scene of continuous outdoor activity, activity which through the years produced a complex stratigraphy of use surfaces, middens, and cultural strata. The plan maps (Figure 6-5) seem to indicate significant sterile areas between the features discussed here. These areas, however, also contained much cultural material and some carbon staining, although no features were recognized during excavation. One can envision all of Zone 24 as a single occupation horizon in which field-assigned feature numbers identify some of the more distinct occupation surfaces.

AREA THREE

Four analytic zones (Zones 33, 34, 35, and 36) provide the temporal outline for the discussion of Kartar features in Area Three, a block excavation just west of Area 2. Cultural features are found in each of these four zones (Figure 6-6).

Zone 36

The earliest of the Kartar Phase components in the Area Three block is an occupation surface exposed in 20-18N58E (Feature 141). In terms of the types and density of material recovered, this feature is similar to housepit floors at 45-OK-11. It is characterized by numerous bone fragments and other debris in a sandy matrix immediately overlying the basalt cobble stratum. Because of its stratigraphic position below other Kartar features, this surface was thought to be quite old, but its radiocarbon date of 4409±137 B.P. is much younger than the 5171±151 B.P. date taken from the cultural stratum above it.

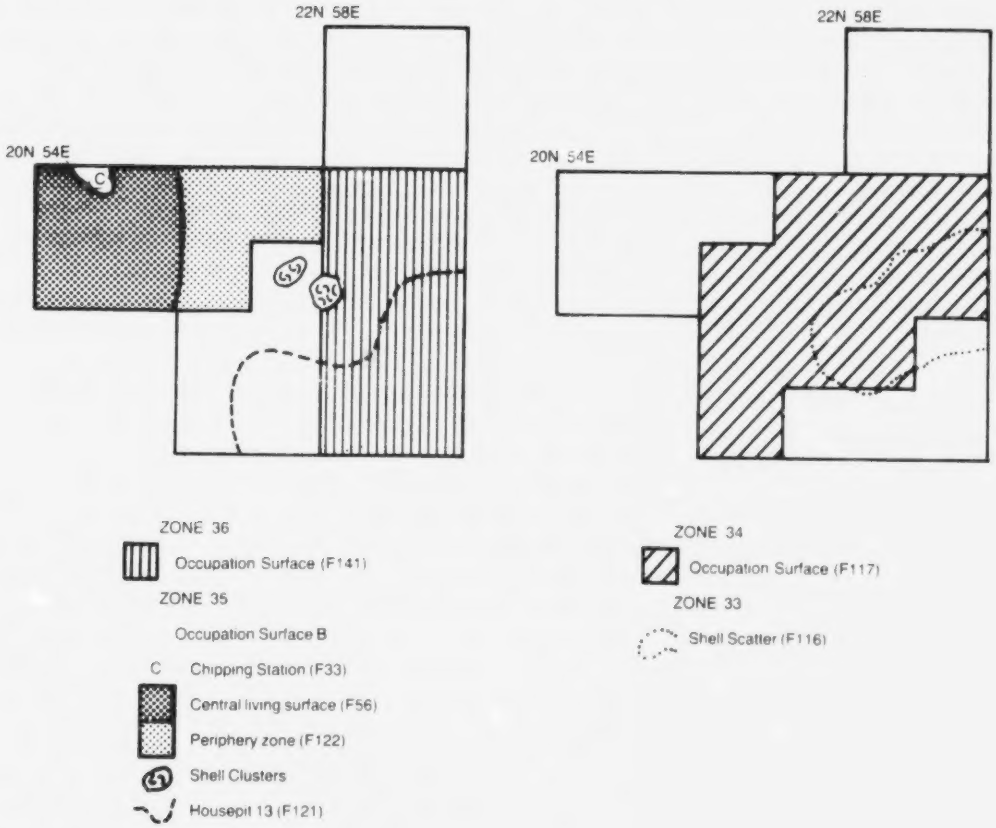

22N 58E
20N 54E
C
22N 58E
20N 54E
ZONE 36
Occupation Surface (F141)
ZONE 35
Occupation Surface B
C Chipping Station (F33)
Central living surface (F56)
Periphery zone (F122)
Shell Clusters
Housepit 13 (F121)
ZONE 34
Occupation Surface (F117)
ZONE 33
Shell Scatter (F116)

Figure 6-6. Plan map of Kartar Component features, Area 3, 45-OK-11.

This inversion may be due to the fact that carbon samples from different excavation units were combined in the case of the younger date. Alternatively, the older date maybe from a disturbed deposit. Whatever its exact age, this Zone 36 occupation surface is unusual in the large number of bone fragments, large cobble tools, and the dominance of cryptocrystalline material in the debitage (compare types in Table 6-2). Fully 60% of the waste flakes (N=222) are opal or jasper. In most Kartar Phase features, basalt and quartzite make up 50-90% of the debitage. However, this Zone 36 surface is similar to other Area Three features in the high proportion of cryptocrystalline material.

Zone 35

A major occupation surface (Occupation Surface B) covers a 5.5 m2 area across the middle of Area Three. This occupation surface contains three distinct areas. Mirroring the distribution of material in Occupation Surface A in Area Two. It also may be the remains of a surface or temporary structure. At the center of Occupation Surface B is a chipping station (Feature 33) which consists of 216 yellow jasper flakes, one quarter of which showed signs of heat treatment or dehydration. This lithic workshop was confined to a .36 m2 area. It lay within a larger, well-defined living surface (Feature 56), marked by charcoal staining, burned soil, and associated debris in a shallow depression (compare with Features 169 and 159 in Occupation Surface A). Debris continued beyond the rim of this depression, sloping gradually down to the east (along the natural slope to the river), forming a peripheral disposal area (Feature 122). Bone fragments and FMR are more numerous in the postulated refuse zone, but smaller than on the central living surface. High densities of cryptocrystalline chipping debris mark all three areas of this surface.

Immediately above the eastern peripheral dispersal zone of Occupation Surface B, are two small shell concentrations (Features 124 and 127). These small clusters of shell seem to represent very limited shell processing, perhaps the work of single individuals.

The last major feature in Zone 35 is a thick, cultural deposit (Feature 121) which overlies the very early Zone 36 surface (Feature 141) and is apparently truncated by Occupation Surface B (Figure 6-7). Plan maps drawn during excavation depict a complex feature with shifting boundaries and no consistent distribution. The stratigraphic profiles show an intensely stained deposit, sloping west and north, thickest at the top and thinning out rapidly at the bottom (Figure 6-7). We reckon this feature (Feature 121) represents the eroded or disturbed remnants of a housepit (Housepit 13) which was constructed after, and destroyed a section of, Housepit 2. As there is insufficient evidence to call this feature a house, and there are alternative interpretations of its origin we have assigned it to the category "cultural strata."

First, the deposit could represent a housepit wall and rim but the plan maps and profiles from the rest of the block do not show any other walls or indicate a floor. Secondly, this deposit of burned shell, burned earth, and charcoal may be a midden; its material density, however, is lower than we

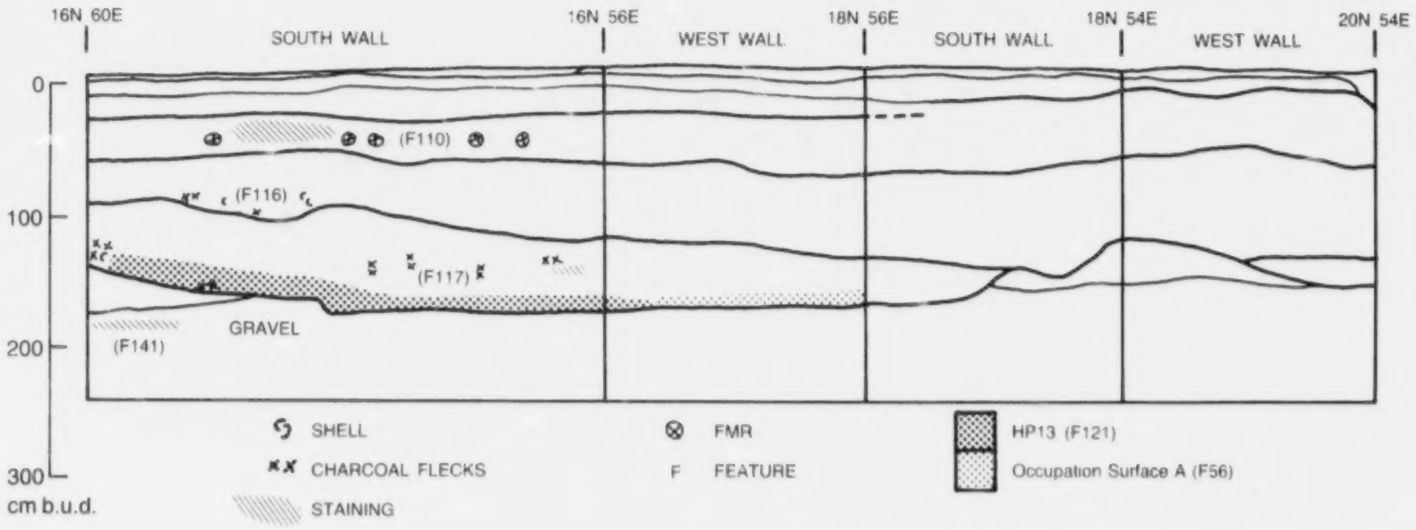

16N 60E
SOUTH WALL
16N 56E
WEST WALL
18N 56E
SOUTH WALL
18N 54E
WEST WALL
20N 54E
0
100
200
300
cm b.u.d.
(F110)
(F116)
(F117)
GRAVEL
(F141)
SHELL
CHARCOAL FLECKS
STAINING
FMR
F FEATURE
HP13 (F121)
Occupation Surface A (F56)

Figure 6-7. Profile of Area 3, showing Housepit 13 wall, Occupation Surface B, and related features, 45-OK-11.

would expect if that were the case. Thirdly, the deposit may be back dirt from the re-excavation of a housepit south or east of the Area Three block which would explain the charcoal and organic staining of the deposit, the relatively low density of material, and, most importantly, the inversion of dates between this stratum, dated to 5171±151 B.P., and the Zone 36 surface below it, dated to 4409±137 B.P.

The older date comes from unit level materials not clearly associated with any feature in this zone. Although taken from the same level as, and presumably dating, Occupation Surface B (Feature 122), the sample did not occur near that feature; profiles indicate its association with Feature 121. In any case, it is stratigraphically above the second date, which is much younger. To determine which date is correct, we must go outside the Area Three block and examine other dated features which may be associated.

Housepit 2 has been dated at 4872±142 B.P. Logically, we might have expected the Area 3 excavations to expose this housepit along its northwest rim, unless that rim had been destroyed by subsequent construction, such as the construction of Housepit 12 (Feature 121). We also might have expected to see the western edge of Occupation Surface A, Area Two, in the Area Three block (Figure 6-1). Feature 141, the oldest surface in Area Three, is the only feature whose eastern boundary might tie in with an occupation surface in Area Two. Its date of 4409±137 B.P. does not overlap (at one standard deviation) the 4770±150 B.P. date for Occupation Surface A. Either Feature 141 equates with Occupation Surface A and its date is too young, or it correlates with one of the several living surfaces noted above Occupation Surface A as its date indicate. In either case if Housepit 2 is truncated by Housepit 13 (Feature 121), then the 5171 B.P. date is much too early. Only if Feature 121 also represents disturbed fill (which is possible) can the 5171 B.P. date be considered valid, but then its presence in a disturbed matrix negates its usefulness in determining a temporal sequence.

Our reconstruction of events in this area is as follow: Housepit 2 was occupied around 4800 B.P., perhaps contemporaneous with, or shortly preceding, Occupation Surface A. The Zone 36 occupation surface (Feature 141) was also used at this time or slightly later. Construction of a housepit in this area destroyed the northwest corner of Housepit 2. This housepit (Feature 121) is preserved in Area Two as a well-defined wall in the south wall of the block (Figure 6-7), and as backdirt or an eroded wall in the west wall profile (not shown). Occupation Surface B truncates the Housepit 13 wall on the east side of the block. We consider both dates from Area Three suspect: the one is too early and may be from a disturbed context; the other seems too late given the tight sequence we have outlined, although relative to other dates in the area, it is not inconsistent. As in the cross-bedded surfaces of Area Two, the succession of features cannot be reconstructed with confidence. However, both areas demonstrate the rapid deposition and reuse of areas at 45-OK-11 within a relatively short time span in the Kartar component.

Zone 34

Another large occupation surface is recorded in Zone 34. Although the material density is not as high as earlier surfaces in Area Three, this feature (Feature 117) is marked by a much wider diversity of stone and bone tools (13 classes), and faunal species (eight different species, including bear). The shape of this living surface was arbitrarily defined by provenience to 1 x 1-m squares (Figure 6-6).

Zone 33

A shell scatter (Feature 116) is recorded in Zone 33. This feature, unlike those below it, slopes to the southwest and may have formed a small mound at one time. Although only 265 hinge pieces were tabulated (Table D-2), a large amount of shell (nearly 2.3 kg) was present. The shell fragments occurred in small clusters and as isolated pieces, perhaps indicating some erosion from the major concentration on the east side of Area Three.

AREA FOUR

Four analytic zones fall into the Kartar Phase occupation in Area Four; cultural features are found in three of them. Zone 46 contains a partially exposed living surface. Zone 45 contains the floor of Housepit 4. A small firepit and the Housepit 4 fill occur in Zone 44 (Table D-1).

Zone 46

The lowest occupation evident in this block is an occupation surface truncated by the construction of Housepit 4 (Figure 6-8). This surface (Feature 185) dates to 5085±168 B.P., roughly contemporaneous with Lower Housepit 1 and Housepit 3. It was exposed within two 2 x 2-m units and exhibited a north to south slope, although its full horizontal extent is unknown. Averaging 7-10 cm thick, this surface was characterized by charcoal staining, burned soil, and some cultural material--a pattern typical of the Kartar Phase housepit floor. Although not proven to be a housepit floor, this living surface may indeed represent an early pit house occupation.

Housepit 4, Zones 45 and 44

Housepit 4 truncates the earlier living surface. It is a roughly circular housepit with moderately sloping walls radiocarbon dated to 4564±150 B.P. (the date is taken from the floor). It is 80 cm deep and 8-9 m across at the rim; the level floor area (Feature 181) is approximately 6 m across and 10 cm thick. No structural features are recorded in Housepit 4. A shell concentration (Feature 183) and a small cluster of FMR (Feature 192) did occur on the south side of the floor. An anvil and milling stones were associated with the shell concentration. The floor, walls, and shell concentration are all intensely fired. Large pieces of charcoal, oxidized soil, and black

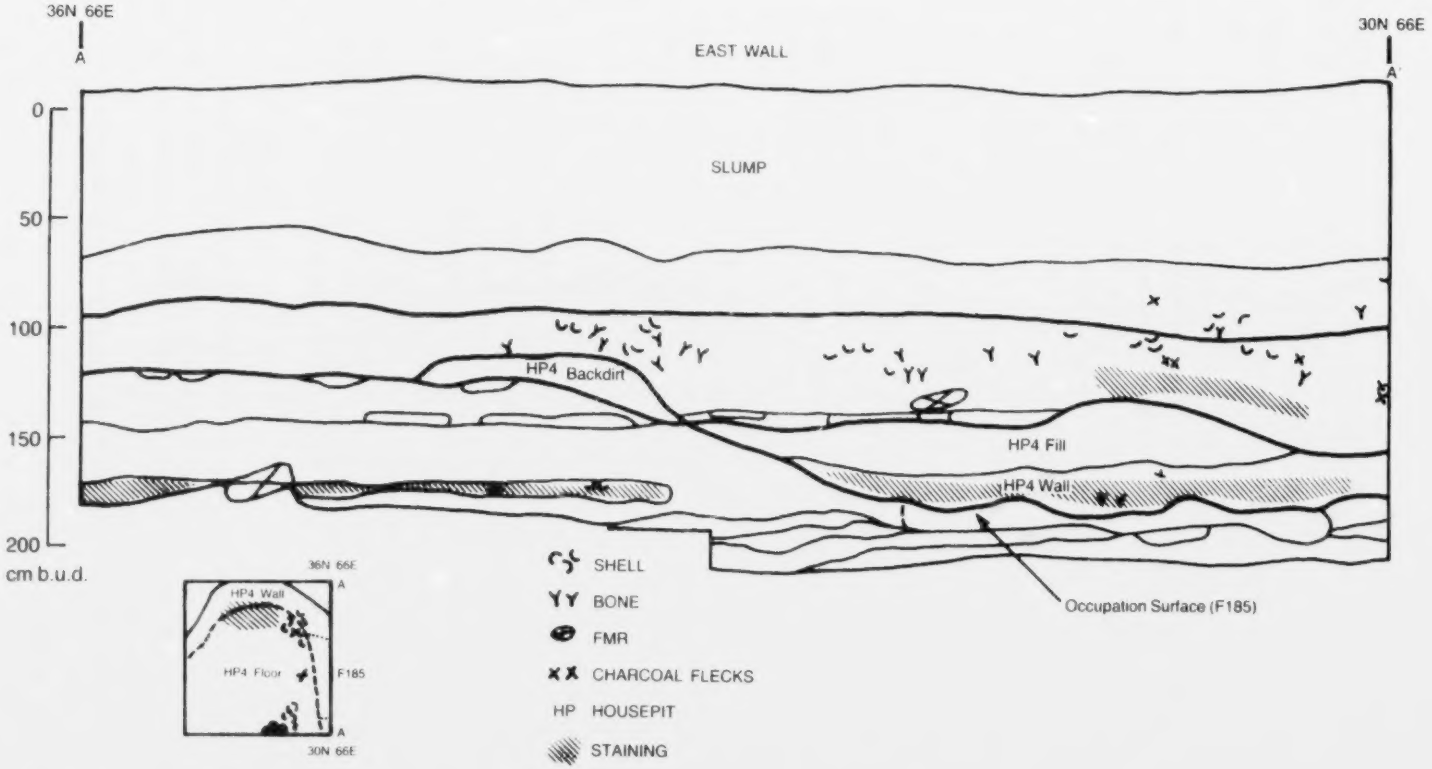

36N 66E
A
EAST WALL
30N 66E
A'
0
50
100
150
200
cm b.u.d.
SLUMP
HP4 Backdirt
HP4 Fill
HP4 Wall
Occupation Surface (F185)
36N 66E
A
HP4 Wall
HP4 Floor
F185
A
30N 66E
SHELL
BONE
FMR
CHARCOAL FLECKS
HP HOUSEPIT
STAINING

Figure 6-8. Profile and plan map of Area 4, Housepit 4, 45-OK-11.

charcoal staining characterized the wall and floor deposits. At least one large piece of charred wood was found; its diameter was 2.5 cm. The shell and some of the other debris on the floor are also burned, indicating that the structure burned while still at least partially intact.

An upper limit to the age of Housepit 4 is provided by the radiocarbon date of 4200±180 B.P., obtained from wall deposits near the rim. It seems to date the upper fill (Feature 200). A small firepit (Features 15, 16) occurred in the fill, immediately above the Housepit 4 floor. No FMR were associated, but an oval, basin-shaped area of intense charcoal staining and burned matrix was recorded. Bone, shell, and a charred piece of birch bark were recovered. No occupation surface is associated with the firepit area within the fill, although the firepit clearly originated above the floor.

AREAS FIVE AND SIX

The large block excavation in which four housepits were uncovered (Figure 6-9) has been divided into two analytic areas: Area Five includes all deposits exterior to the housepits themselves (i.e., exterior surfaces, house fill, and strata above and below the houses), while Area Six includes the floors, walls, and associated features of Housepits 11 and 12, and Upper and Lower Housepits 1. Table D-1 correlates the cultural features discussed here with the proper analytic zones. The discussion is not, however, organized by analytic zone, but by housepit, in ascending order from oldest to youngest.

Here we must mention the discrepency between material counts given in Tables D-2 through D-5 and those in Chapter Two. In tabulating material counts for housepit walls, fill, etc., we have used the feature designations established in the field. However, some of these features crosscut analytic zones. For example, Feature 5, the shell-covered wall in Upper Housepit 1, extended well outside the house and this was assigned to both Zone 61 (Upper Housepit 1 wall and floor) and Zone 54 (deposits exterior to and contemporaneous with Upper Housepit 1), although we have used all of Feature 5 in this chapter to determine material counts and densities for the upper housepit wall. A similar situation occurs with Feature 6, the shell wall in Lower Housepit 1, which extended beyond the housepit rim; it occurs in Zones 65 and 54. For readers who wish to compare the interior (Area 6) and exterior (Area 5) materials, the tables in Chapter Two reflect this more accurately.

Lower Housepit 1

Lower Housepit 1 is the oldest of the four housepits in this block, underlying Upper Housepit 1 (Figure 6-9 and 6-10). A date of 5047±249 B.P. from its floor places it among the earliest housepits recorded on the Columbia Plateau. A date of 4808±130 B.P., in the fill above and associated with Upper Housepit 1, provides an upper limit for the age of Lower Housepit 1.

Lower Housepit 1 is curvilinear (i.e., it has rounded corners, but fairly straight sides), measuring approximately 10 x 10 m at the rim, and 10 x 7-8 m on the floor. The smaller floor area is due to the low sloping wall on the east side of the housepit; the other three walls are nearly vertical. The

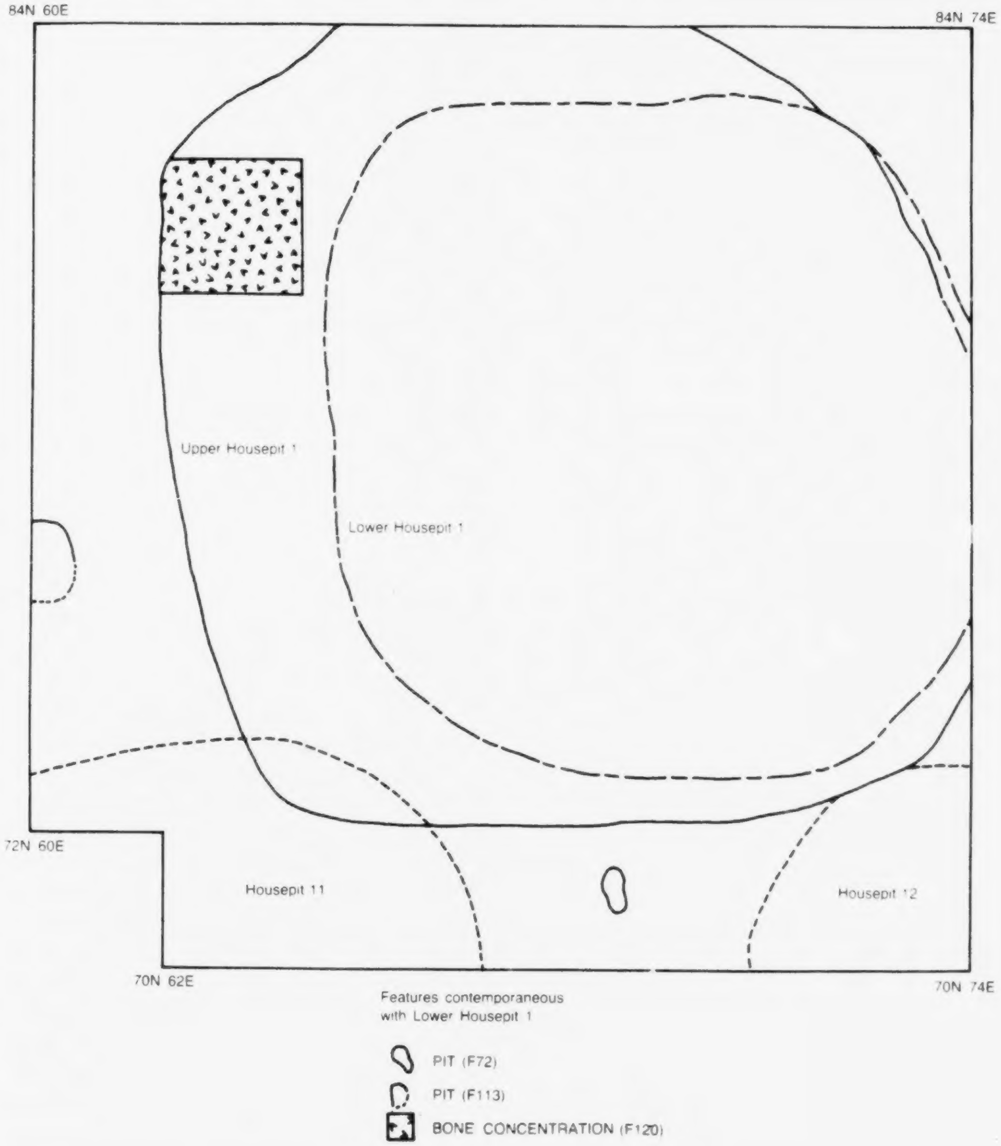

84N 60E
84N 74E
Upper Housepit 1
Lower Housepit 1
72N 60E
Housepit 11
Housepit 12
70N 62E
70N 74E
Features contemporaneous with Lower Housepit 1
PIT (F72)
PIT (F113)
BONE CONCENTRATION (F120)

Figure 6-9. Plan map of Area 5/6, Kartar Component features, 45-OK-11.

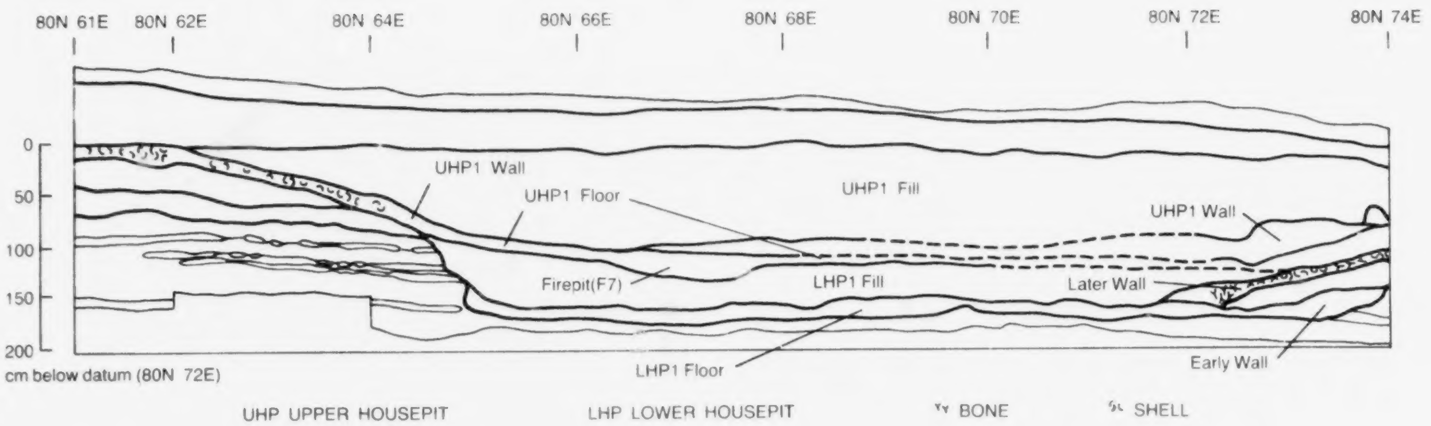

80N 61E
80N 62E
80N 64E
80N 66E
80N 68E
80N 70E
80N 72E
80N 74E
0
50
100
150
200
cm below datum (80N 72E)
UHP1 Wall
UHP1 Floor
UHP1 Fill
UHP1 Wall
Firepit(F7)
LHP1 Fill
Later Wall
LHP1 Floor
Early Wall
UHP UPPER HOUSEPIT
LHP LOWER HOUSEPIT
BONE
SHELL

Figure 6-10. Profile of 80N Line, Upper and Lower Housepit 1, 45-OK-11.

vertical walls, while intensely stained in spots, carried very little debris; the east wall, however, was a sloping, shell-covered feature, laden with all classes of material, including a variety of chopping and cutting tools. Mean bone fragment weight for this east wall is 0.52 g, very similar to the mean weight of the bone fragments on the floor, while FMR tend to be half the size of those on the floor (FMR in firepits excluded). Shell and FMR densities are higher within the wall than on the floor; this reflects, of course, the shell-paved nature of the east wall as well as the debris disposed of upon it. The purpose of the sloping, shell-lined wall is uncertain. It was not for stabilization: the vertical walls did not require any modification, so it is doubtful that this sloping wall should need to be stabilized. It may be that, since the east side of the pit house is lower than the other three walls, the area had to be built up to make all four walls the same height. However, the shell pavement itself may be merely a midden deposit, spilling over into the (abandoned) housepit depression. The extension of the shell beyond the housepit rim supports this theory. On the other hand, a firepit and a concentration of FMR were located within the shell layer, and, according to field notes, are associated with the housepit occupation. We suggest that the shell "wall" is merely an extension of an existing shell midden, but whether the shell and debris were deliberately used to line the housepit or whether the midden sloped into the depression is unclear.

The shell overlies an earlier wall, which was little more than an extension of the floor that sloped upwards slightly. A side entryway in the northeast corner of the earlier wall is marked by a "trough" or depression in 80N72E and 82N72E. The later shell paving completely covers this depression, indicating the abandonment of the entry.

The floor of Lower Housepit 1 does not exhibit the same intense staining or thickness as the floor of Upper Housepit 1 (see below). However, more features are associated with the floor of the lower housepit. Two firepits, seven other pits, and lithic, bone, or shell concentrations are recorded on the floor. The dimensions and contents of these features are shown in Table 6-6; they are illustrated in Figure 6-11. Two possible postmolds along the north and south walls (Figure 6-11) were noted but not described separately. The several FMR concentrations, often associated with shell, may be remnants of small hearths. No central firepit occurred; heating and cooking apparently were accomplished by small fires spaced around the pit house. Two pits and a scatter of large bone fragments (Features 72, 113, and 120, respectively, in Zone 55) appear to be exterior features contemporaneous with the occupation of Lower Housepit 1. Their dimensions and contents are listed in the tables. Material density is very low for the pit features, a characteristic of pit features at 45-OK-11 (Table 6-1). The bone concentration consists of several large bone fragments recorded in a 2 x 2 x .10-m excavation level; many were burned and some show signs of butchering. Mountain sheep was the only species positively identified; other identified bone was deer-sized (Table D-5).

Table 6-6. Dimensions of pits and firepits, 45-OK-11.

Component	Feature Type	Association	Feature Number	Area (cm)	Depth (cm)
Hudnut	Exterior firepit	-	4	70 x 30	5[1]
			11	46 x 20	4[1]
			13	20 x 30	4
			22	68 x 52	12
			27	83 x 75	12[1]
			29	46 x 30	27[1]
			30	65 x 30	11[1]
			58	73 x 50	8[1]
			65	80 x 60	7
			178	75 x 75	13
			187	65 x 65	10[1]
			190	50 x 40	11[1]
Kartar	Exterior pit	-	24	30 x 32	8
			34	110 x 40	30[1]
			35	70 x 30	50[1]
			72	60 x 25	11
			81	125 x 90	20[1]
			113	100 x 100	40
	Exterior firepit	-	32	75 x 75	24
			79	30 x 30	10
			161	110 x 80	20
			167	50 x 50	18
	Interior pit	Upper Housepit 1	70	52 x 52	18
			80	25 x 25	10
		Lower Housepit 1	14/135	100 x 100	24
			91	50 x 40	20
			108/123	60 x 60	20
			111	40 x 40	9
			119	80 x 80	22
			131	80 x 50	15
			138	80 x 50	9
	Interior firepit	Upper Housepit 1	7	99 x 50	15
			88/92	150 x 150	20
		Lower Housepit 1	10	46 x 64	15
			109	100 x 70	
		Housepit 9	26	95 x 35	10[1]
		Housepit 11	74	50 x 50	10

[1] Feature only partially exposed.

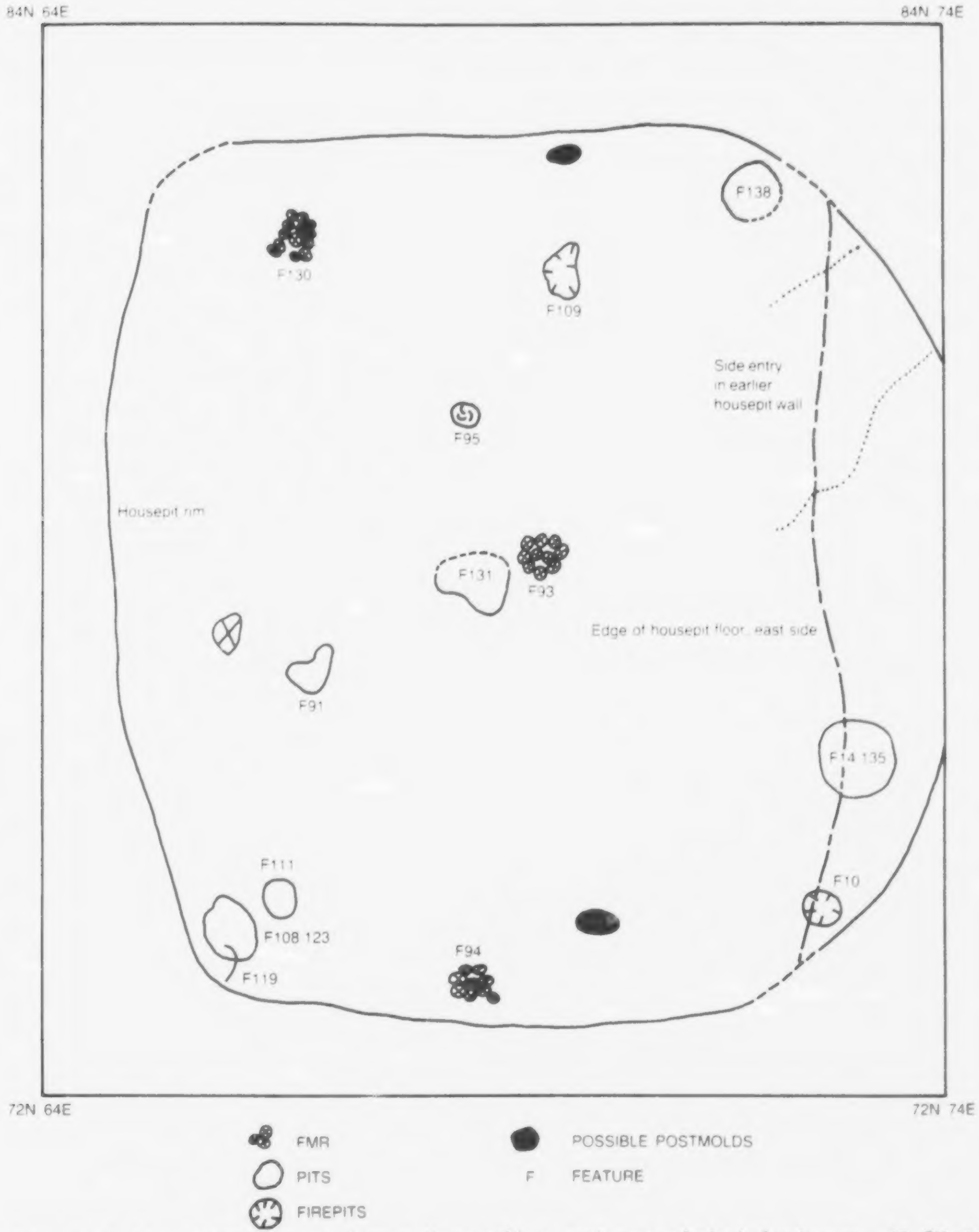

84N 64E
84N 74E
F138
F130
F109
Side entry
in earlier
housepit wall
F95
Housepit rim
F131
F93
Edge of housepit floor, east side
F91
F14 135
F111
F10
F108 123
F94
F119
72N 64E
72N 74E
FMR
POSSIBLE POSTMOLDS
PITS
F FEATURE
FIREPITS

Figure 6-11. Plan map of Lower Housepit 1 and associated features, 45-OK-11.

Housepit 12

Housepits 11 and 12 were constructed near Lower and Upper Housepits 1 (Figure 6-1) in the interval between them. Neither was extensively exposed, so their size and shape cannot be determined. Housepit 12 is a deep, steep-walled structure which contained very little debris and no prepared wall or recognizable floor. Apparently, Housepit 12 was not occupied very long and may have been subject to slumpage during its occupation. It is bracketed by the two Housepits 1; it truncated the upper wall and fill of Lower Housepit 1 and was disturbed, after its abandonment, by the construction of Upper Housepit 1. Figure 6-12 depicts the relationship between Housepit 12 and the upper and lower housepits.

Housepit 11

Housepit 11, on the other hand, contained a well-defined and compacted floor (Features 57 and 75). Material was recovered in roughly the same density as in the Housepit 1 floors. Charred wood (Feature 66), a firepit (Feature 74) and concentrations of FMR (Feature 82) and shell (Feature 83) were recorded on the floor of Housepit 11. The firepit is a small surficial area, 50 x 50 cm (Table 6-6), of charcoal and oxidized soil with only three FMR. Charred wood is also found in the fill of Housepit 11, suggesting that the burned superstructure of the dwelling collapsed gradually as the depression filled with sand and debris. Unlike Housepit 12, Housepit 11 is fairly shallow with more moderately sloping walls. It may have been contemporaneous with or slightly younger than Lower Housepit 1.

Upper Housepit 1

Upper Housepit 1 has been dated to 4719±150 B.P., by a date from a hearth near the northwest corner of the house floor. A second date of 4808±180 B.P. was taken from an area of intense charcoal staining below the floor, in the fill between the two Housepits 1. The shape of the upper housepit is somewhere between square and circular, with rounded corners and at least two straight sides (Figure 6-13). The walls slope moderately, so that the floor area of 7 x 7.5 m is much smaller than the rim dimensions (12 x 12 m). The housepit is approximately 30 cm deep; the surface of origin was never well identified.

The floor of the upper housepit was moderately to intensely stained by charcoal and organic material. Fairly square in shape, it covers about 42 square meters, and varies in thickness from 5 to 15 cm. It slopes slightly towards the center where a large, shallow firepit (Features 88 and 92) was uncovered. This firepit, between 1.5 and 2 m across (Table 6-6), had contained fires of sufficient intensity to bake the underlying matrix. The several FMR or bone fragments recovered, however, exhibited no pattern. Its size and shallowness (10 cm deep) suggest that this "firepit" was merely an area upon which fires were built. A second, smaller firepit (Feature 7) yielded the date of 4719±150 B.P. Unlike the first firepit, the second

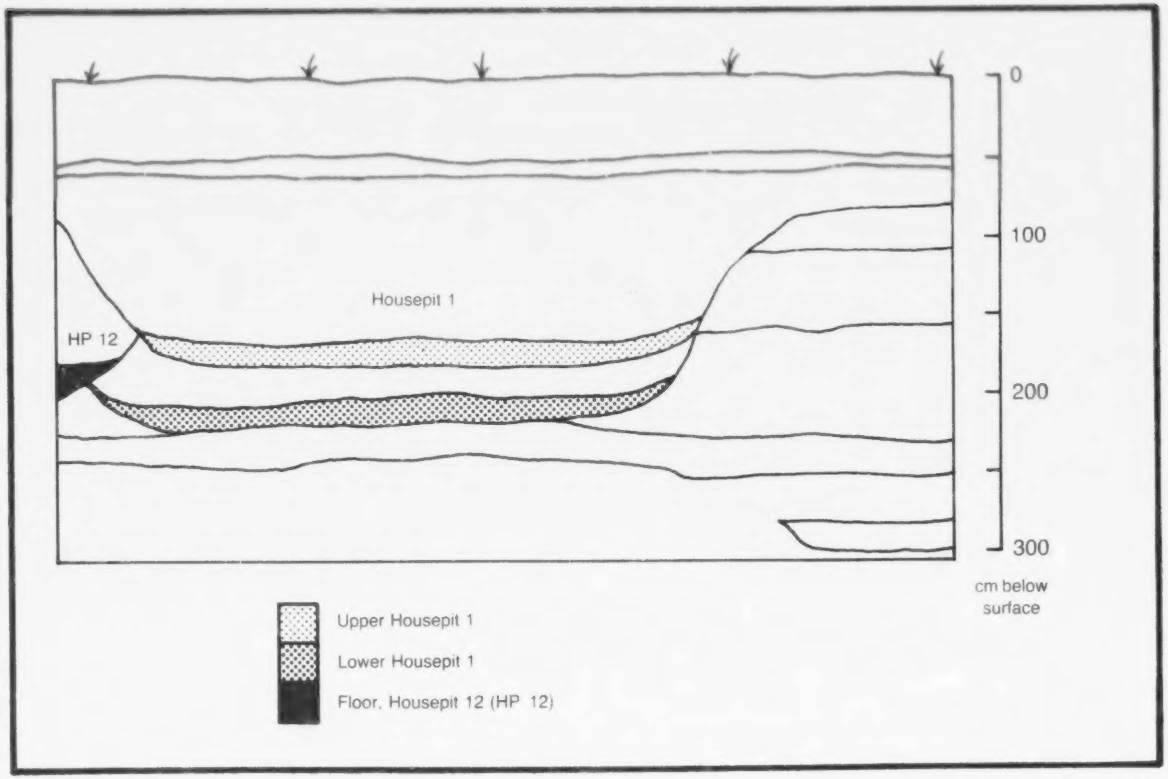

0
100
200
300
cm below surface
Housepit 1
HP 12
Upper Housepit 1
Lower Housepit 1
Floor, Housepit 12 (HP 12)

Figure 6-12. Schematic profile of stratigraphic sequences of Upper and Lower Housepit 1 and Housepit 12, 45-OK-11.

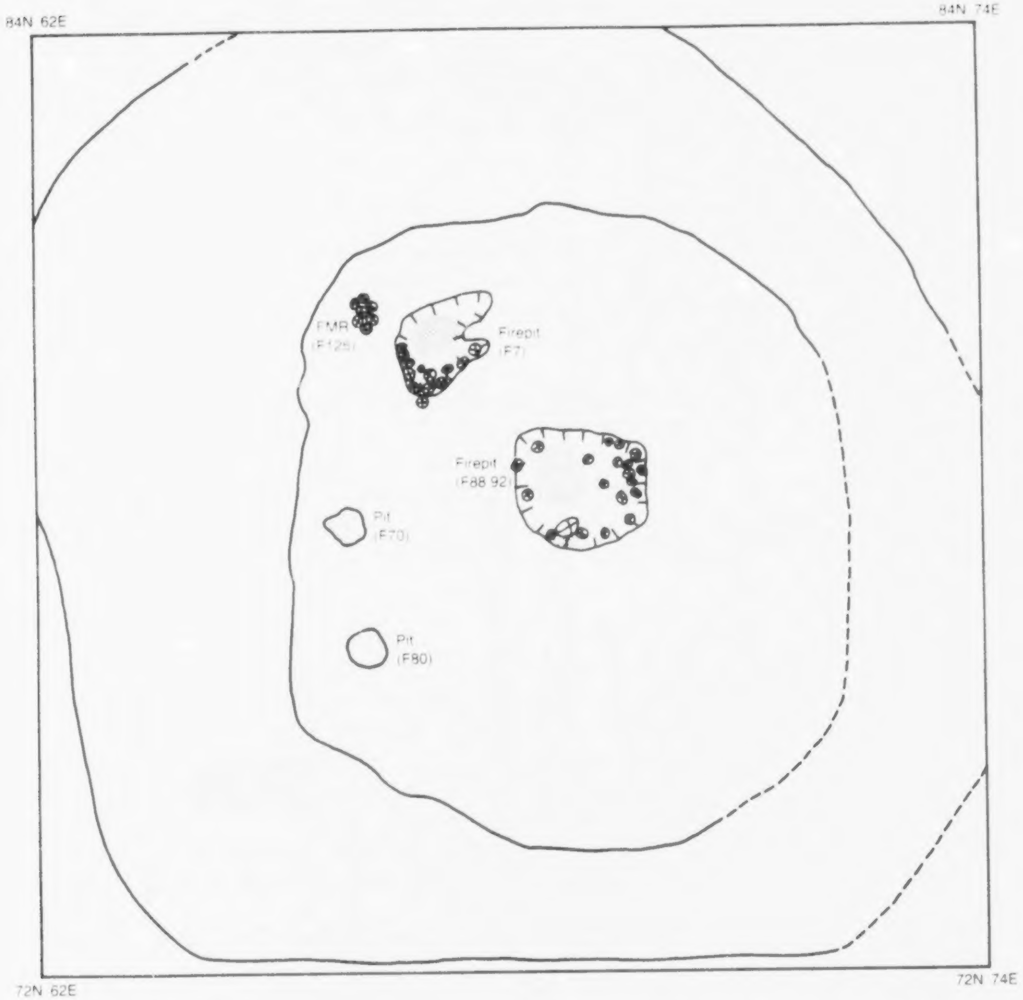

84N 62E
84N 74E
FMR
(F125)
Firepit
(F7)
Firepit
(F88 92)
Pit
(F70)
Pit
(F80)
72N 62E
72N 74E

Figure 6-13. Plan map of Upper Housepit 1 and associated features, 45-OK-11.

contained over 60 FMR in a tight, semi-circular cluster. Thirty-six waste flakes were recovered as well, all but one of them cryptocrystalline. This is a striking anomaly in the lithic assemblages of the Kartar Phase component at 45-OK-11. Generally, 50-90% of the debitage from any feature is basalt or coarse quartzite. This concentration of cryptocrystalline material suggests that the firepit was part of a lithic work area and used in heat treating the raw material. Sixteen FMR (Feature 125) were grouped just north of this firepit and may be associated. They weigh, on the average, twice as much as the FMR in the firepit.

Two pits are also found in the Upper Housepit 1 floor. Feature 80, on the southeast side, is small, with a soft, sandy fill, and very little material (Table 6-6). It may have been a posthole. Feature 70 is nearly 60 cm in diameter (Table 6-6) and contains large bone fragments (mean weight 0.88 g) and over one hundred shell hinge pieces. According to excavator's notes, this shell actually lined the pit, suggesting that this was a storage pit with shell laid down deter to rodents. This pit is on the west side of the housepit.

In Upper Housepit 1, occupational debris occurred in large quantities in the walls as well as on the floor. For the most part, the wall was marked by light charcoal staining and cultural debris, up to 10 cm thick. Texturally, the wall differed little from the fill above (Feature 100) and the inter-house deposits (Feature 104) below. On at least two sides, however, the wall of the upper housepit was covered by a sloping layer of shell, varying from 5 to 20 cm thick (Features 5 and 149). As in the case of the east wall of Lower Housepit 1, we judge the shell layer in the west wall of Upper Housepit 1 to represent a cultural modification of the housepit wall rather than the natural in-filling of the housepit depression. The shell layer was thickest near the rim of the housepit and thinned out near the juncture with the housepit floor; it has an abrupt horizontal boundary on the south side (78N62E), possibly indicating the presence of an entryway. The shell covered an earlier wall (Feature 102) that showed signs of having slumped. However, the shell layer does extend well beyond the rim of the housepit. Thus it would appear that a large shell midden had formed outside of Upper Housepit 1, part of which was used to reconstruct the western wall of Upper Housepit 1 during a period of its reuse.

Both the original wall (Feature 102) and the later, reconstructed wall (Feature 5) contain much cultural material. However, the reconstructed wall generally contains less material per cubic meter than the floor of Upper Housepit 1, while the original walls display higher densities of all material except bone than the later shell wall, and much higher densities of bone and FMR than the floor of Upper Housepit 1. The average weight of bone and FMR in the original wall is 0.5 g and 164.0 g while the average weights on the floor are 0.34 g and 110.0 g respectively. That material densities are highest in the reconstructed wall suggests that the housepit occupants disposed of the large debris in the corners and wall of the housepit either during occupation of the housepit or while cleaning the housepit before modifying the wall.

Outside the upper housepit are features deposited at about the same time the housepit was constructed. For the most part, these deposits are continuations of the shell layers which line the housepit walls and slope up over the rim to the exterior surface (e.g., Feature 5). One deposit (Feature 90), however, contains material which originates in the occupation of Lower Housepit 1. This material was badly disturbed by the subsequent construction of the upper housepit and was redeposited in the Housepit 12 depression, providing fill to build up the rim of Upper Housepit 1.

Above Upper Housepit 1

In the fill (Feature 100) above Housepit 1, in the northwest corner, a well-defined occupation surface was recorded in a 3 x 6-m area (Figure 6-14). This surface (or surfaces) was situated within the limited shelter of the housepit depression and consisted of charcoal mottling and organic staining in a sandy matrix. Recorded in several nonadjacent units, this feature may represent several similar, but unrelated, occupations. Concentrations of bone, shell, or FMR were recorded (Features 24, 28, 53, 54, 55, 63, 64, 68, 76, 78, 79, and 81). In most instances, no change in matrix from the general fill was discernible; the presence of this occupation was determined by the clustering or increase of cultural debris.

Two pits are recorded in association with this in-fill occupation. The first (Feature 24) is a circular (30 cm diameter), flat-bottomed pit with very little debris. It is only 8 cm deep. The second (Feature 81), although larger (125 x 90 cm), is much less well defined and was not recognized until it was seen to contrast with the Upper Housepit 1 floor into which it intruded. Only the bottom five centimeters of this pit were recorded. Like other pits at 45-OK-11, it contained very little material.

No direct dates are available for the occupation surface or other features in this zone (Zone 53). Diagnostic artifacts are overwhelmingly Cascade-like.

AREA SEVEN

Only two analytic zones have been assigned in Area Seven; Analytic Zone 2 encompasses all the Kartar Phase deposits. Three cultural features were recorded in this zone; all are part of a large bone concentration, which has been dated to 4486±134 B.P.

The Bone Concentration

An extensive bone concentration dating to the Kartar occupation of the site, covered most of this 3 x 3-m block (Figure 6-15 illustrates the distribution of the larger bone fragments). Three major subconcentrations were identified. The first (Feature 3) contains deer and deer-sized bone fragments, along with several mountain sheep teeth and jaw fragments. This concentration is located just north of the center of the block, near an anvil stone. Ribs and long bone fragments, seemingly split for marrow extraction,

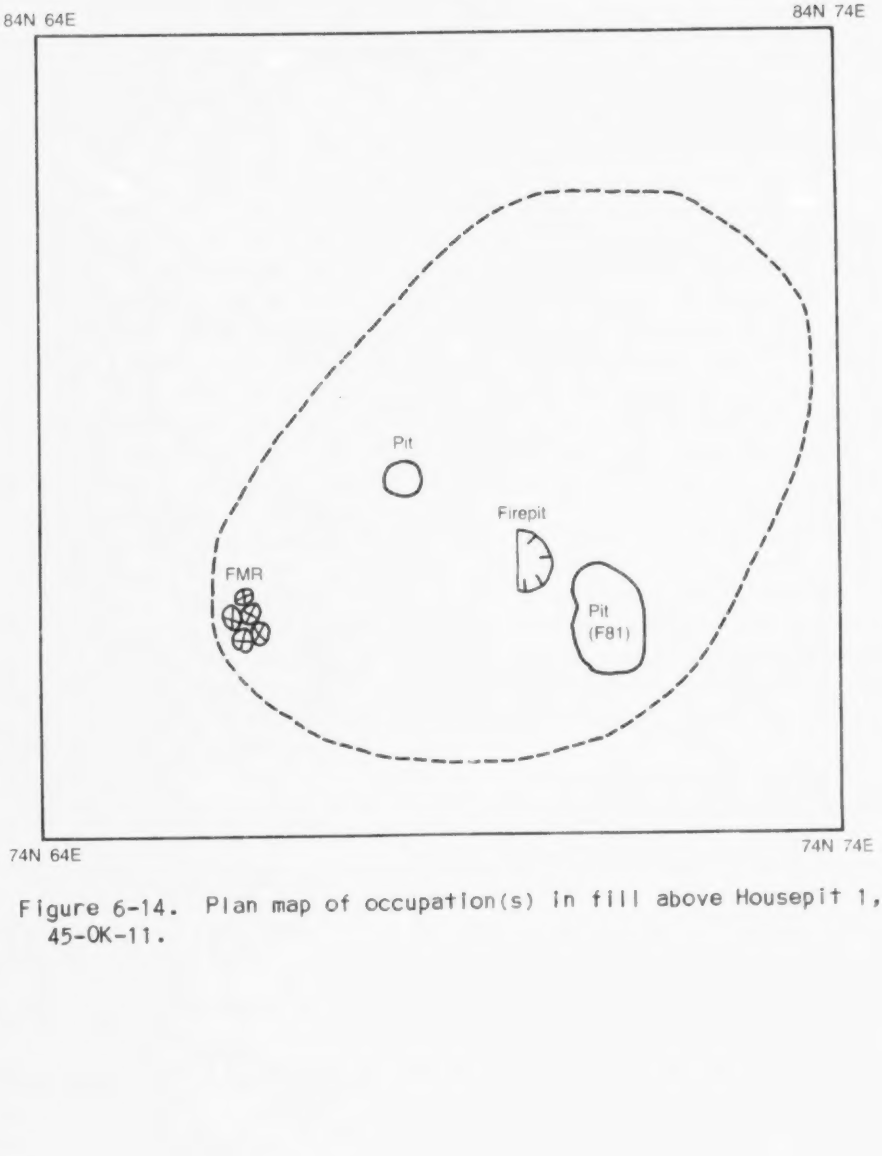

84N 64E
84N 74E
Pit
Firepit
FMR
Pit
(F81)
74N 64E
74N 74E

Figure 6-14. Plan map of occupation(s) in fill above Housepit 1, 45-OK-11.

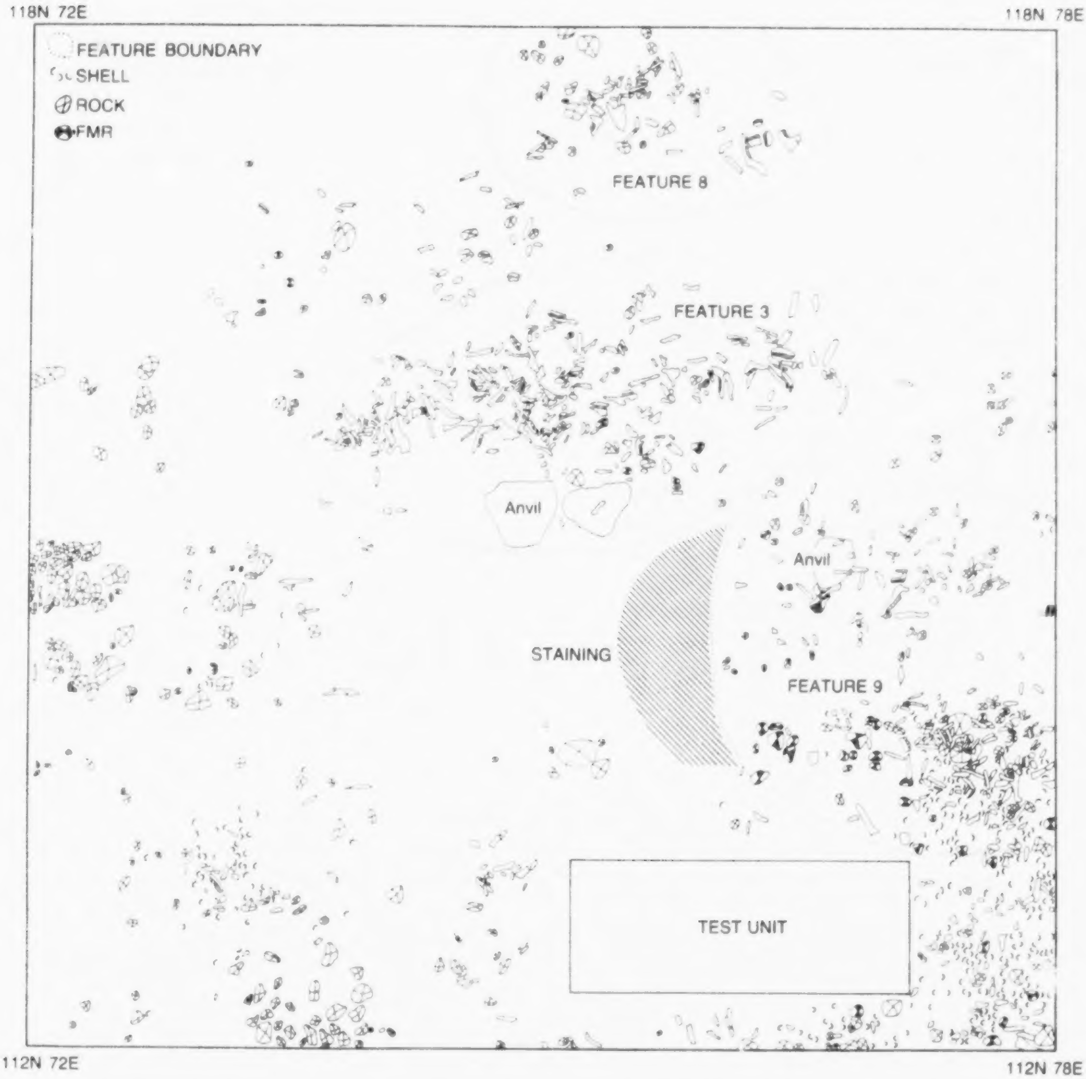

118N 72E
118N 78E
FEATURE BOUNDARY
SHELL
ROCK
FMR
FEATURE 8
FEATURE 3
Anvil
Anvil
STAINING
FEATURE 9
TEST UNIT
112N 72E
112N 78E

Figure 6-15. Plan map of the bone concentration, Area 7, Zone 2, 45-OK-11.

also occur in large numbers. The tools associated with this butchering spot include cutting and pounding tools as well as an awl and a bead (Table D-3 and D-4).

Just north of the first concentration is a smaller pile of bone (Feature 8). Eight deer or deer-sized bone fragments were identified, with smaller numbers of pronghorn, mountain sheep, and elk-sized pieces of bone (Table D-5). The greater variety of species, the fewer tools, and the circumscribed character of the area suggest that this pile of bone represents a dumping area for the surrounding butchering activity area.

The third concentration (Feature 9) contains fewer but larger bones, clustered around an anvil stone on the east side of the block. Seventy-five of the 77 bone fragments identified are deer or deer-sized. It appears that very preliminary processing of deer took place here, judging from the size of the bone recovered (average weight is 2.16 g) and the predominance of pounding tools in the lithic assemblage (Table D-3).

Bone is noticeably lacking in the butchering area in the center of the block, especially in 115N74-75E and 114N74-75E (Figure 6-15). Ringed on all four sides by larger pieces of bone and, on the north and east sides, by the featured bone concentrations, this 2 x 2-m area was not lacking in bone. Indeed, over 6,000 bone fragments were recovered in 20-40 cm of deposits (Figure 6-16). However, the mean weight of the bone fragments from this central area is 0.24 g, or approximately one-quarter that of the mean bone weight in the featured bone concentrations. Also recorded within this central area was a dark mottled stain. These lines of evidence suggest that further reduction of the bone took place in the center of the activity area, leaving small bone fragments and an organic stain. Another area of final processing is indicated by the low mean weight of bone fragments (0.16 g) recovered among the rocks in 115-116N72E (Figure 6-16).

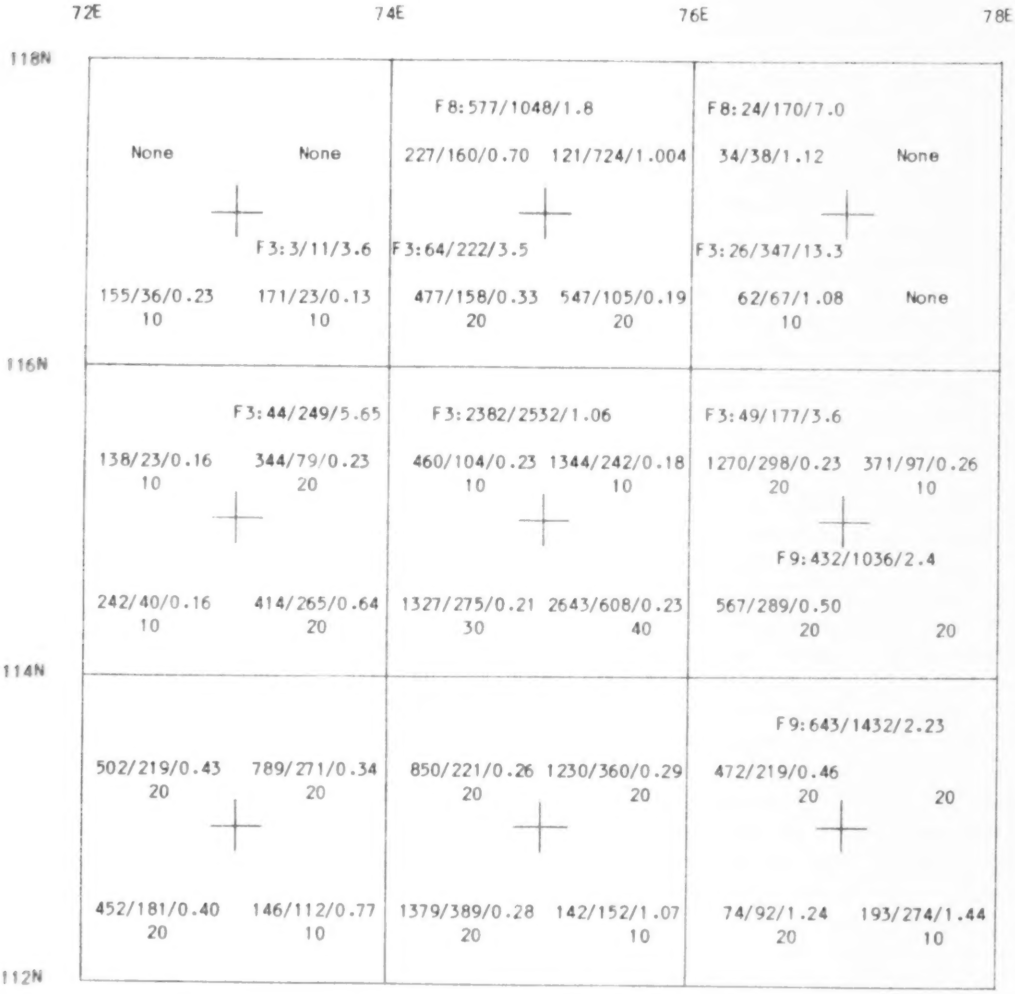
The activity areas identified in Area Two and Area Three, the bone concentration in Area Seven can be divided into three zones. There is a central zone containing small bone fragments and possible organic residue, an intermediate zone where fairly large, butchered bones, anvil stones, chopping tools, and some cutting and scraping tools occurred; and a refuse zone where bone from several animals was piled.

AREA EIGHT

A circular pit (Feature 2), bowl-shaped in profile, is the only Kartar Phase feature recorded in Area 8, Zone 2 (Figure 6-2). The pit measures 60 cm in diameter and is 9 cm deep. It contained a few large pieces of charcoal and carbon staining, but no other material.

THE HUDNUT PHASE

The Hudnut Phase occupation at 45-OK-11 is characterized by large scatters of debris, particularly fire-modifed rock, and very few structured features. No housepits or other large pits occur. Several firepits are


72E
74E
76E
78E
118N
116N
114N
112N
F8:577/1048/1.8
F8:24/170/7.0
None
None
227/160/0.70
121/724/1.004
34/38/1.12
None
F3:3/11/3.6
F3:64/222/3.5
F3:26/347/13.3
155/36/0.23
10
171/23/0.13
10
477/158/0.33
20
547/105/0.19
20
62/67/1.08
10
None
F3:44/249/5.65
F3:2382/2532/1.06
F3:49/177/3.6
138/23/0.16
10
344/79/0.23
20
460/104/0.23
10
1344/242/0.18
10
1270/298/0.23
20
371/97/0.26
10
F9:432/1036/2.4
242/40/0.16
10
414/265/0.64
20
1327/275/0.21
30
2643/608/0.23
40
567/289/0.50
20
20
F9:643/1432/2.23
502/219/0.43
20
789/271/0.34
20
850/221/0.26
20
1230/360/0.29
20
472/219/0.46
20
20
452/181/0.40
20
146/112/0.77
10
1379/389/0.28
20
142/152/1.07
10
74/92/1.24
20
193/274/1.44
10

KEY

# Bone/Total weight/Mean weight
Thickness (cm)

Figure 6-16. Distribution of bone by feature and unfeatured unit levels, the bone concentration, Area 7, 45-OK-11.

recorded, but some of these are little more than burned areas. Material density of the recorded features is usually quite low.

Figure 6-17 shows the Hudnut Phase features as well as unfeatured FMR concentrations. Some of the densest concentrations of FMR occur in Areas Two, Four, and Five and above Housepit 9 and Housepit 3. It appears that in these areas activity was centered in the depressions above the Kartar Phase housepits and occupation surfaces. The north end of the site appears to have been little used at this time; neither features nor scatters of FMR are recorded in Areas Seven and Eight.

AREA ONE, ZONE 1

Four possible firepits are recorded in Area One. All are nearly devoid of cultural material, including FMR (Table D-2). One (Feature 13) is associated with high counts of FMR (Figure 6-17), although it contains no FMR itself.

A large (65 x 30 cm) area of charcoal-stained and reddish soil (Feature 30) is the furthest south of these firepits. It contained only two bone fragments, one of which was identified as salmon, and a jasper flake. The second firepit (Feature 29) is similar to the first, although smaller: a red-brown staining of rodent-disturbed soil containing very little material.

Two other firepits in Area One lie north of the Housepit 4 block excavation. Feature 13 was a lens of charcoal and ash; enough carbon was recovered to obtain a date of 2800±130 B.P. (B-4285). About one third (20 x 30 x 4 cm) of the firepit was excavated. Again, cultural material was practically nonexistent, although high counts of FMR are recorded in this unit (38N68E). The last firepit (Feature 11, 60N68E) is nearly 50 cm in diameter and 4 cm deep; it contained two FMR and eight bone fragments.

Also included in Area One is a firepit uncovered in Testing Unit 54N72E. Both its depth and the occurrence of FMR within and around the firepit indicate that it is associated with the Hudnut Phase occupation. It is oval in shape, 50 cm long, and 14 cm deep. No material counts are available for the testing feature, but debitage, FMR, pieces of ocher, and bone fragments are all recorded. A radiocarbon sample from this feature provides a second date of 3557±523 B.P. for the Hudnut Phase occupations. (A third date of 3872±412 B.P. comes from unit level material in Testing Unit 24N67E, level 80. No FMR scatter is associated with this sample.)

AREA TWO, ZONE 2

A large, but disturbed firepit (Feature 27) is the only Hudnut Phase feature recorded in Area Two. Most of the excavations in this area were of Kartar deposits; a bulldozer stripped away the younger overburden. Unlike those in Area One, this firepit is full of cultural material, including 18 FMR and concentrations of charcoal. It is 12 cm deep and 83 cm long, irregular in both plan and profile.

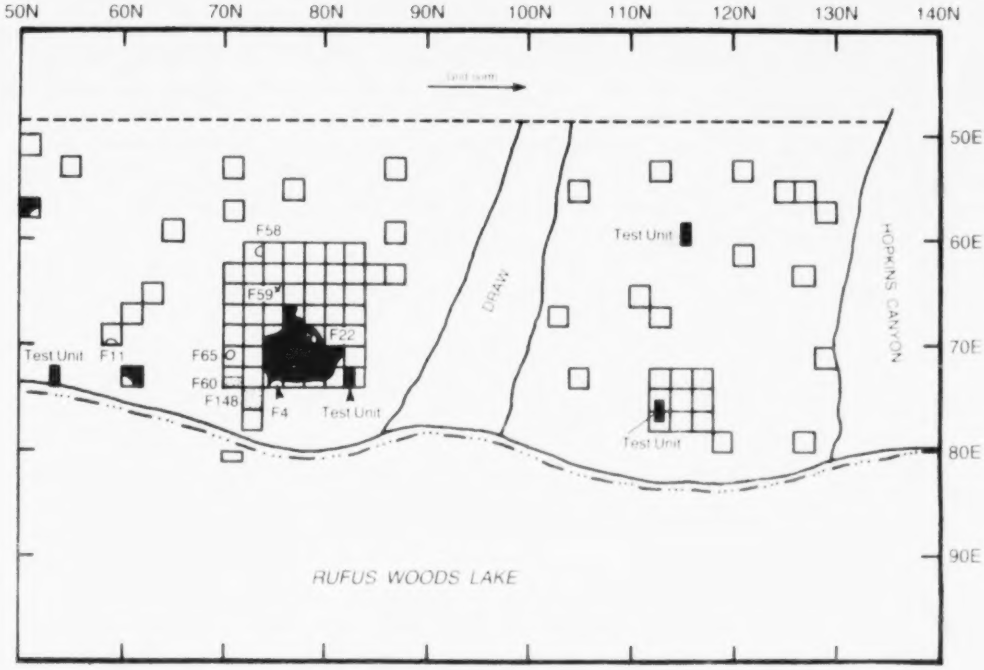

50N
60N
70N
80N
90N
100N
110N
120N
130N
140N
50E
60E
70E
80E
90E
F58
F59
F22
F65
F60
F148
F4
F11
Test Unit
Test Unit
Test Unit
Test Unit
DRAW
HOPKINS CANYON
RUFUS WOODS LAKE

Figure 6-17. Location of features, Hudnut Component, 45-OK-11.

AREA THREE, ZONE 2

A portion of a Hudnut Phase FMR scatter cuts diagonally through the Area Three block (Feature 110; Figure 6-17). Material density for the feature is comparable to the older occupation surfaces below it, except for the increase in FMR and the scarcity of mussel shells. Bone fragments are much smaller in this FMR scatter (x=0.16 g) than in the Kartar Phase features, however. (In other Hudnut Phase features, too few bone fragments were recovered to determine mean weights.) No matrix change accompanied this feature: there was no new soil horizon or definable surface. The lack of an obvious associated surface is common to all of the Hudnut Phase features.

AREA FOUR, ZONE 2

The Hudnut Phase occupation above Housepit 4 is typical of Hudnut Phase materials at 45-OK-11, consisting of scatters of FMR and an occasional firepit. Lithic materials tend to be almost exclusively cryptocrystalline.

Two areas of FMR scatter (Features 173 and 175) are recorded in three separate excavation units. These apparently are part of a fairly dense FMR scatter seen on the east side of the block in Figure 6-17. Three firepits and a pile of FMR occur within this more general distribution.

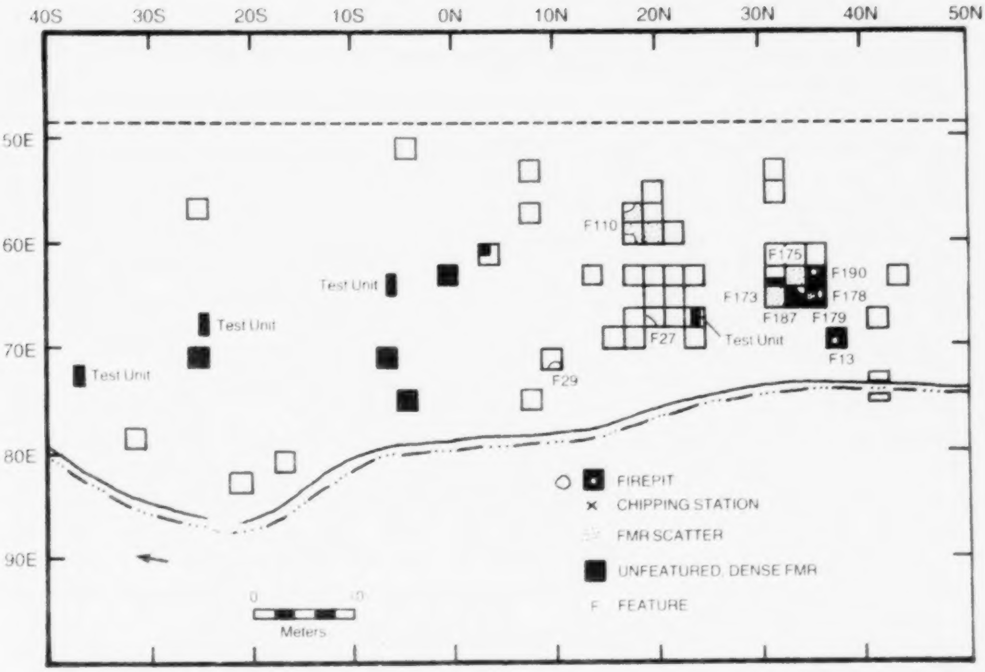

40S
30S
20S
10S
0N
10N
20N
30N
40N
50N
50E
60E
70E
80E
90E
F110
F175
F190
F178
F173
F187
F179
F13
F27
F29
Test Unit
Test Unit
Test Unit
Test Unit
Test Unit
FIREPIT
CHIPPING STATION
FMR SCATTER
UNFEATURED, DENSE FMR
F FEATURE
0
10
Meters

Figure 6-17. Cont'd.

An amorphous pile of 50 FMR (Feature 179) occurs in 35N65E, just east of a circular, rock-lined firepit (Feature 178). The firepit is approximately 80 cm in diameter and 13 cm deep. Plan drawings (Figure 6-18) indicate the clear association between the two features and the conspicuous lack of FMR in one half of the firepit. Perhaps the pile of FMR represents rock removed from the firepit. Aside from the FMR and some small bone fragments, very little was recovered from either feature.

A second firepit (Feature 187) was discovered two meters south of the first (Figure 6-17). Partially destroyed by slumping, this firepit's remaining sides suggest a rectilinear form, at least 60 cm on a side, and 10 cm deep. It contained far fewer FMR than the first firepit in Area 4 (Feature 178) and was marked by a layer of charcoal staining over a reddened, hardened matrix.

The third firepit (Feature 190; Figure 6-18) is just west of the first in 35N62E. It consists of 16 FMR lying in a shallow depression (50 cm in diameter). No well-defined pit was discerned, and no charcoal or burne soil was associated.

One thing is particularly striking about the distribution of fire-modified rock among these features. The average weight of FMR in the general scatter (Features 173 and 175) is 140-150 g, while in the firepits and pile of FMR, the average weight ranges from 215 (Feature 187) to 1,180 g (Feature

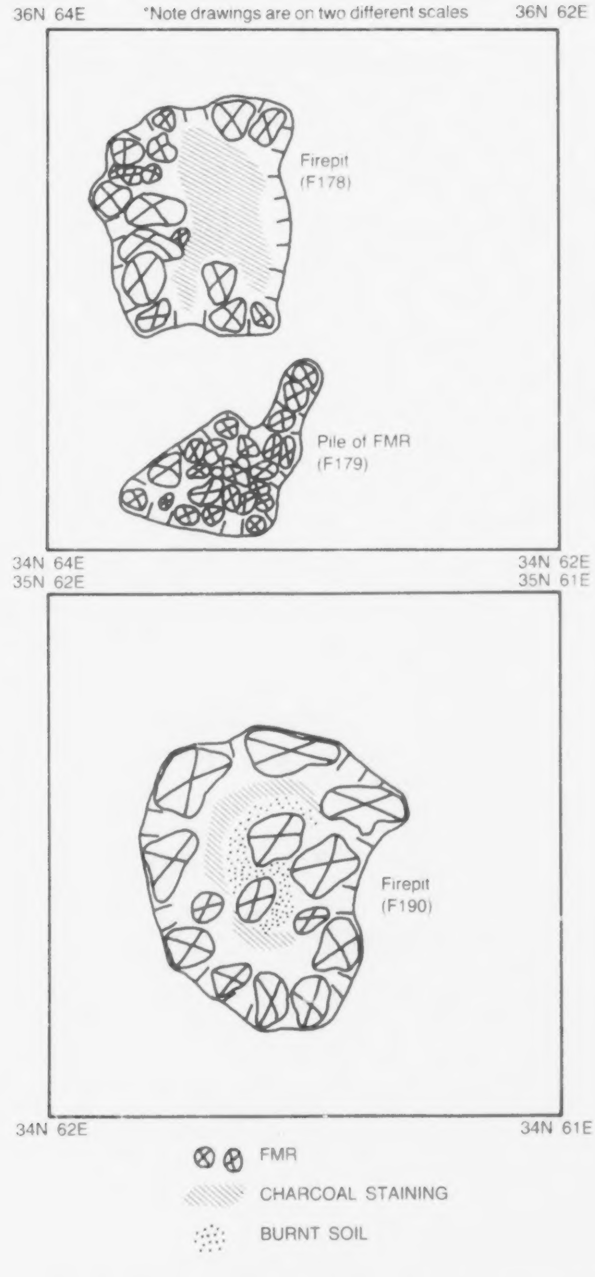

36N 64E
*Note drawings are on two different scales
36N 62E
Firepit
(F178)
Pile of FMR
(F179)
34N 64E
35N 62E
34N 62E
35N 61E
Firepit
(F190)
34N 62E
34N 61E
⊗ ⊗ FMR
▨ CHARCOAL STAINING
⁘ BURNT SOIL

Figure 6-18. Plan maps of selected firepits, Hudnut Component, 45-OK-11.

190). It appears that as firepits were cleaned, larger rocks were left in place, while smaller, broken pieces were discarded.

AREA FIVE, ZONE 2

In Area Five, two portions of the Hudnut Phase deposits were given separate feature numbers because of high numbers of FMR. These are in 72N72E (Feature 60) and in 74N74E (Feature 148). However, a larger concentration of FMR lying immediately above the Housepit 1 area (Figure 6-17) was not featured separately. Four firepits and a lithic concentration are found elsewhere in the block.

The lithic concentration, probably a chipping station, consists of 19 opal flakes in a 0.0012 cubic meter area (25 x 10 x 4 cm). Two utilized flakes were also recovered. Several possible cores, with partial cortex, were found nearby.

Like other firepits at 45-OK-11, the four firepits in Area Five contain very little material, other than the FMR with which they are lined. They are circular or oval, and basin-shaped. Charcoal staining and burned soil is at best vague or, occasionally, absent altogether. No matrix change is associated with these features; no living surface was discerned. The dimensions of these four firepits are list in Table 6-6.

DISCUSSION OF FEATURE TYPES

The first part of this chapter has described the cultural features recorded at 45-OK-11 and placed them within their spatial and temporal contexts at the site. We now turn to a discussion of the types of features recorded, noting significant structural properties and artifact distributions among types.

The development of a standardized feature typology is a necessary step in the comparison of all the sites excavated by the Chief Joseph Dam Project. Although our conclusions for this one site using this typology may seem limited, they are intended as merely one step toward a more encompassing analysis.

The feature typology developed for 45-OK-11 is made up of five major feature types: housepits, firepits, pits, exterior occupation surfaces, and debris scatters. An "other" category is used to deal with isolated cultural features which, in the analysis of this single site, have limited significance but which may later prove to be important. Each of these categories can be subdivided. The categories and subdivisions are sown below.

Some feature types (e.g., postmolds) are obviously missing; they were not recorded separately at 45-OK-11 (only two possible postmolds were recorded at all), and so were not included in the typology. They would be included at other sites, however.

Distinctions were made between some interior and exterior features, such as pits. However, interior debris concentrations were considered part of the floor or wall of the housepit and tabulated as such. The delineation of activity areas within housepits (see below) identified these concentrations of debris adequately. Therefore, only debris concentrations which occurred outside housepits were considered as a separate feature.

The greatest problem with the development of the feature typology is that it relies solely on the identification of features in the field. For example, in the Bone Concentration in Area 7, only three major groups of bone received feature numbers while the rest of the area was recorded as unit level material (see Area 7, Kartar component). We judge, however, that the number of "missing features" is small and probably would not significantly affect the proportions or densities in the tables below.

HOUSEPITS

Despite our conservative assignment of cultural features, thirteen housepits were originally identified. Two of these, however, were dropped for lack of suitable documentation. Several of the "living surfaces" give every indication of being dwelling floors, although they lack the pronounced rims or shoulders which would ensure positive identification. Eleven housepits should be considered a bare minimum of the actual number of dwellings at the site. Because the 2 x 2-m excavation unit provides such a narrow field of view, the identification of large, complex features is difficult. We could only define a housepit if excavation exposed a rim or sloping floor. A unit dropped into the center of a structure with an ill-defined floor would, for instance, probably be identified as an exterior living surface, if it were distinguished at all. Only if the necessary keys to identification were exposed could the presence of a housepit be determined.

The eleven housepits at 45-OK-11, dated between 5100 and 4200 years B.P., are all in the Kartar Phase component (Table 6-7). Since the physical attributes of housepits may be temporally diagnostic, we begin with a discussion of size, shape, and depth. This is followed by a closer look at the activity areas on the floors of Upper and Lower Housepits 1 and Housepit 4, and some conclusions about the nature and arrangement of those activities. Finally, we examine and compare the artifact assemblages from the five feature types within housepits before moving on to the remaining feature types.

Size and Shape

Table 6-5 summarizes the information on size and shape for the housepits at 45-OK-11. In most instances, shape and diameter are unknown. Only Housepit 4 and Upper and Lower Housepits 1 were sufficiently exposed to determine size and shape. Housepit 4 probably is circular, while the other two are curvilinear; that is, they have at least one straight side and rounded corners. Size also is variable: Housepit 4 is approximately eight to nine meters across. Upper Housepit 1, with its gradually sloping walls, is nearly 12 meters in diameter at the rim. (By contrast, Occcupation Surfaces A and B are seven and five meters across, respectively.) Floor area also is quite variable, depending on the size of the structure and the degree of slope in the walls. Usually the floor area itself is fairly level.

Table 6-7. Feature types by components, 45-OK-11.

Feature Type	Kartar Component	Hudnut Component	Total
Housepit	11	–	11
Interior firepit	5	–	5
Interior pit	9	–	9
Exterior occupation surface	14	–	14
Exterior firepit	5	12	17
Exterior pit	7	–	7
Shell concentration	13	–	13
Bone concentration	3	–	3
FMR scatter	–	5	5
Mixed debris concentration	1	–	1
Cultural stratum	1	–	1
Stain	4	–	4
FMR concentration	–	1	1
Lithic concentration	–	1	1
Total	73	19	96

Depth and Walls

Wall construction ranged from the nearly vertical walls of Lower Housepit 1 to the 30-40 degree slope exhibited by some of the walls in Upper Housepit 1. Indeed, even in Lower Housepit 1, the east wall also sloped about 40-45 degrees. Depth of the housepits, from surface of origin (where it could be determined) to the contact of wall and floor, ranged from 30-40 cm (Upper Housepit 1, Housepit 2, Housepit 9, Housepit 11), to 60-80 cm (Lower Housepit 1, Housepit 4, Housepit 12). Moderately sloping walls (less than 45 degrees) appear to be associated with shallower housepits; steeply sloping to vertical walls with deeper housepits. (The reader should bear in mind, however, the limited size of our sample.) Some walls may have been lined with shell.

Activity Areas

The delineation of activity areas on housepit floors is fairly difficult, given the time span involved (during and since occupation) and the sand that makes up most of the site's matrix. Repeated occupations, and horizontal and vertical movements of artifacts, all blur the static picture of activity. Further, only three housepits were excavated extensively enough that

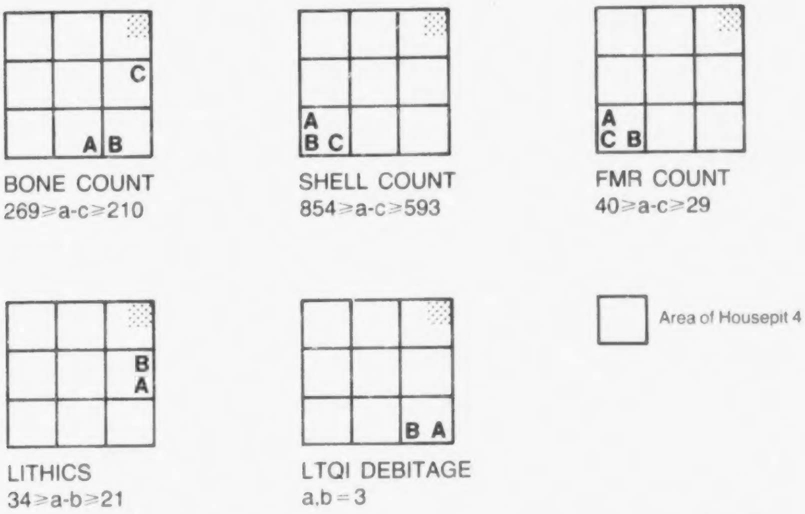
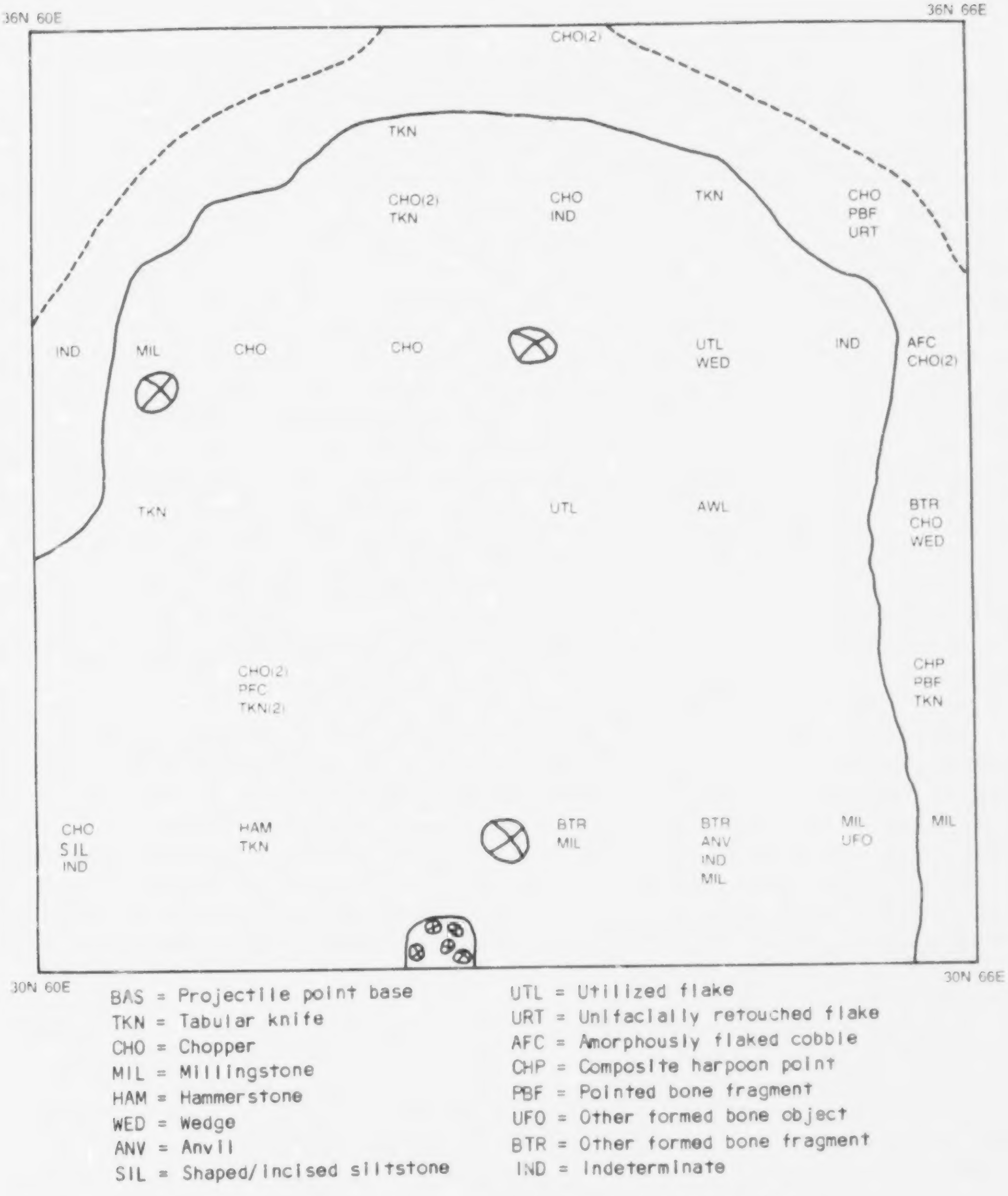


Figure 6-20. Distribution of material types, Housepit 4, 45-OK-11.

delineation of activity areas could be attempted. Each of these three--Housepit 4, Upper Housepit 1, and Lower Housepit 1--show a different pattern.

Housepit 4

Figures 6-19 and 6-20 show the floor of Housepit 4. In Figure 6-19, the provenience of stone and bone tools is shown within 1 x 1-m squares. In Figure 6-20, distributions of bone, shell, FMR, and lithic debitage are also referenced to 1 x 1 m-squares. In this figure, densities of material significantly larger than elsewhere in the block are placed in "Division 9" (Divisions 1-8 contain lesser amounts of material.) "Division 9" is divided into subunits, and recorded alphabetically. Only the "Division 9" letters are outlined in Figure 6-20. A comparison of the two figures reveals no discernible patterning in either tools or debris on the floor. Most of the debris occurs on or near the wall, suggesting disposal areas, but the floor itself is relatively clean. A few possible activity areas do suggest themselves. The concentration of shell, FMR, and milling stones in the southeast corner may indeed reflect a shell processing area, while the bone and choppers in the northeast corner may indicate meat processing there. Several tools occur on the floor itself, but seem to be fairly randomly distributed and are not associated with high numbers of shell or bone. Conspicuous in their absence are cutting tools and projectile points; even the number of flake tools is small (3). It may be that chipped stone tools and other finished products were removed when the house was abandoned, with only non-portable artifacts and cobble tools left behind.


36N 60E
36N 66E
CHO(2)
TKN
CHO(2)
TKN
CHO
IND
TKN
CHO
PBF
URT
IND
MIL
CHO
CHO
UTL
WED
IND
AFC
CHO(2)
TKN
UTL
AWL
BTR
CHO
WED
CHO(2)
PFC
TKN(2)
CHP
PBF
TKN
CHO
SIL
IND
HAM
TKN
BTR
MIL
BTR
ANV
IND
MIL
MIL
UFO
MIL
30N 60E
30N 66E

BAS = Projectile point base
TKN = Tabular knife
CHO = Chopper
MIL = Millingstone
HAM = Hammerstone
WED = Wedge
ANV = Anvil
SIL = Shaped/incised siltstone
UTL = Utilized flake
URT = Unifacially retouched flake
AFC = Amorphously flaked cobble
CHP = Composite harpoon point
PBF = Pointed bone fragment
UFO = Other formed bone object
BTR = Other formed bone fragment
IND = Indeterminate

Figure 6-19. Distribution of tool types, Housepit 4, 45-OK-11.

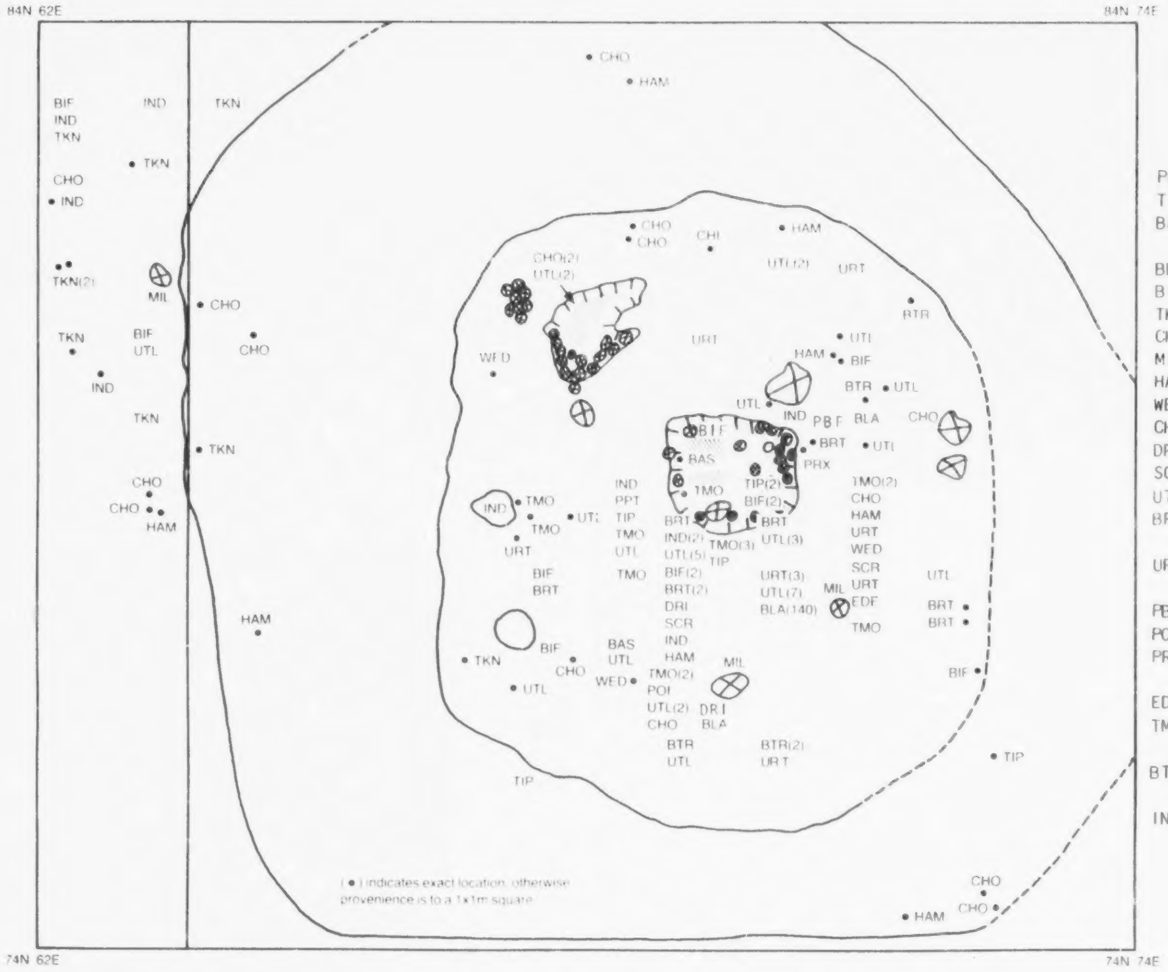
That there are no concentrations of small pressure flakes, as there are in Upper Housepit 1, may indicate that Housepit 4 was not occupied very long.

Upper Housepit 1

The patterns revealed on the floor of Upper Housepit 1 are as enigmatic as those of Housepit 4, but for the opposite reason: there is so much material on the floor that subtle patterns, if they exist, are impossible to distinguish. Figures 6-21 and 6-22 indicate the provenience of formal tool types and material types, respectively. In Figure 6-21, exact provenience for some artifacts is indicated by an asterisk; otherwise, provenience is to 1 x 1-m unit. The distribution of material types indicates that most activity took place on the south sides of the two firepits, except for the high densities of shell along the walls (see description of Upper Housepit 1). In the 2 x 3-m area just south of the larger, central firepit (Figure 6-22), numbers of bone, lithic debris, formed tools, and FMR occur, as do small pressure flakes. In the 1 x 3-m area encompassing the southern half of the other firepit are high counts of bone, FMR, lithic debitage, and small pressure flakes. A secondary concentration of bone also occurs northeast of the second firepit. Apparently, a variety of activities--food processing, lithic reduction--took place in these areas (Figure 6-23). A third activity area is indicated by the recovery of over 20 marmot astragali on the east side of the housepit, along the wall and floor (these marmot bones are not reflected in the identified fauna of Table D-5 because the levels from which they were recovered were not given feature numbers). Although marmots may have been consumed by later groups (Stahl 1982), this assemblage of astragali is puzzling. Perhaps they would be strung as necklaces or on clothing, or represent debris from hide processing.

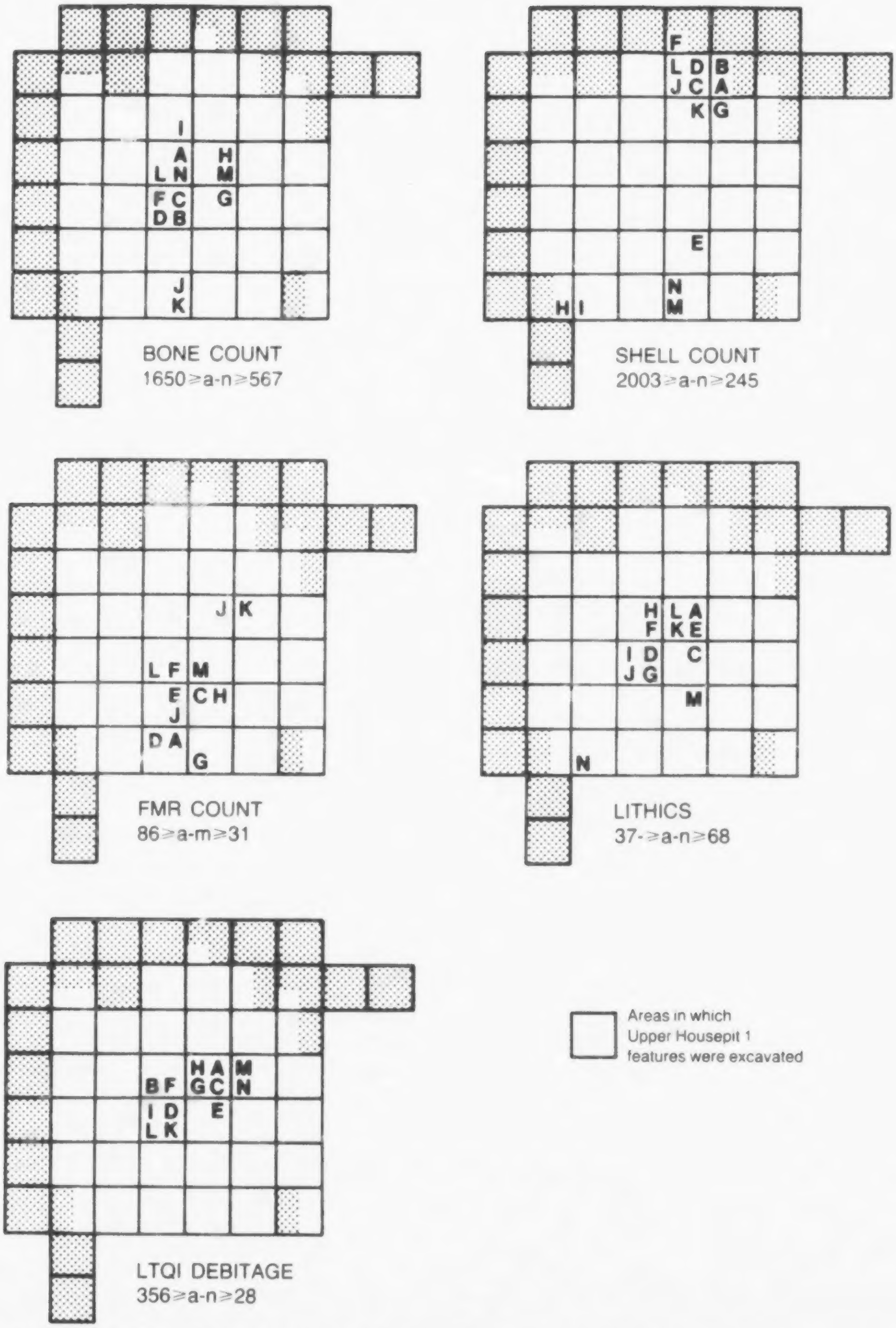
The distributions of shell and FMR reveal little about specific activity areas. The densities of shell along the wall on the west and southeast side probably reflect the manner of wall construction rather than _in situ_ shell processing. Similarly, the ubiquitous FMR on the east side (Figure 6-22) may result from the dismantling of the central hearth or from the natural movement of rock through sandy deposits over the last 5,000 years. A side entry on the west side was postulated by excavators because of an abrupt boundary in the shell along the wall. We have suggested an eastern entryway based on the accumulation of all classes of debris here, from the floor up along the wall to the housepit rim.

The tool types recovered from the floor and walls of Upper Housepit 1 do not seem to correspond with any particular types of material; the greatest number of tools occur south and east of the central firepit, apparently resulting from the numerous activities which took place there. It seems odd that Upper Housepit 1, which was not burned and presumably not abandoned hastily, should contain so many finished tools, while Housepit 4, which was burned, should contain so few. The large numbers of tools, and other material, on the floor of Upper Housepit 1 probably reflects many seasons of continuous use. The evidence for cleaning and modification of the housepit wall also suggests several occupations.


84N 62E
84N 74E
74N 62E
74N 74E
BIF
IND
TKN
IND
TKN
TKN
CHO
IND
TKN(2)
MIL
CHO
TKN
BIF
UTL
CHO
IND
TKN
TKN
CHO
CHO
HAM
HAM
CHO
HAM
CHO
CHO
CHI
HAM
CHO(2)
UTL(2)
UTL(2)
URT
BTR
URT
WED
UTL
HAM
BIF
BTR
UTL
UTL
IND
PBF
BLA
CHO
BIF
BAS
BRT
UTL
PRX
IND
TMO
TMO
UTL
URT
IND
PPT
TIP
TMO
UTL
TMO
BRT
IND(2)
UTL(5)
BIF(2)
BRT(2)
DRI
SCR
IND
HAM
TMO(2)
POI
UTL(2)
CHO
TMO
TIP(2)
BIF(2)
BRT
UTL(3)
TMO(3)
TIP
URT(3)
UTL(7)
BLA(140)
MIL
TMO(2)
CHO
HAM
URT
WED
SCR
URT
EDF
TMO
UTL
BRT
BRT
BIF
BIF
BRT
BIF
TKN
CHO
UTL
BAS
UTL
WED
MIL
DRI
BLA
BTR
UTL
BTR(2)
URT
TIP
TIP
CHO
CHO
HAM
(●) indicates exact location, otherwise provenience is to a 1x1m square

PPT = Projectile point
TIP = Projectile point tip
BAS = Projectile point base
BLA = Blade
BIF = Biface
TKN = Tabular knife
CHO = Chopper
MIL = Millingstone
HAM = Hammerstone
WED = Wedge
CHI = Chisel
DRI = Drill
SCR = Scraper
UTL = Utilized flake
BRT = Bifacially retouched flake
URT = Unifacially retouched flake
PBF = Pointed bone fragment
POI = Bone point
PRX = Long bone articular end
EDE = Edged end bone
TMO = Technologically modified bone
BTR = Other formed bone fragments
IND = Indeterminate

Figure 6-21. Distribution of tool types, Upper Housepit 1, 45-OK-11.


I
A
L N
F C
D B
H
M
G
J
K
F
L D B
J C A
K G
E
N
M
H I
J K
L F M
E C H
J
D A
G
H L A
F K E
I D C
J G
M
N
H A M
B F G C N
I D E
L K

BONE COUNT
1650≥a-n≥567

SHELL COUNT
2003≥a-n≥245

FMR COUNT
86≥a-m≥31

LITHICS
37-≥a-n≥68

LTQI DEBITAGE
356≥a-n≥28

Areas in which Upper Housepit 1 features were excavated

Figure 6-22. Distribution of material types, Upper Housepit 1, 45-OK-11.

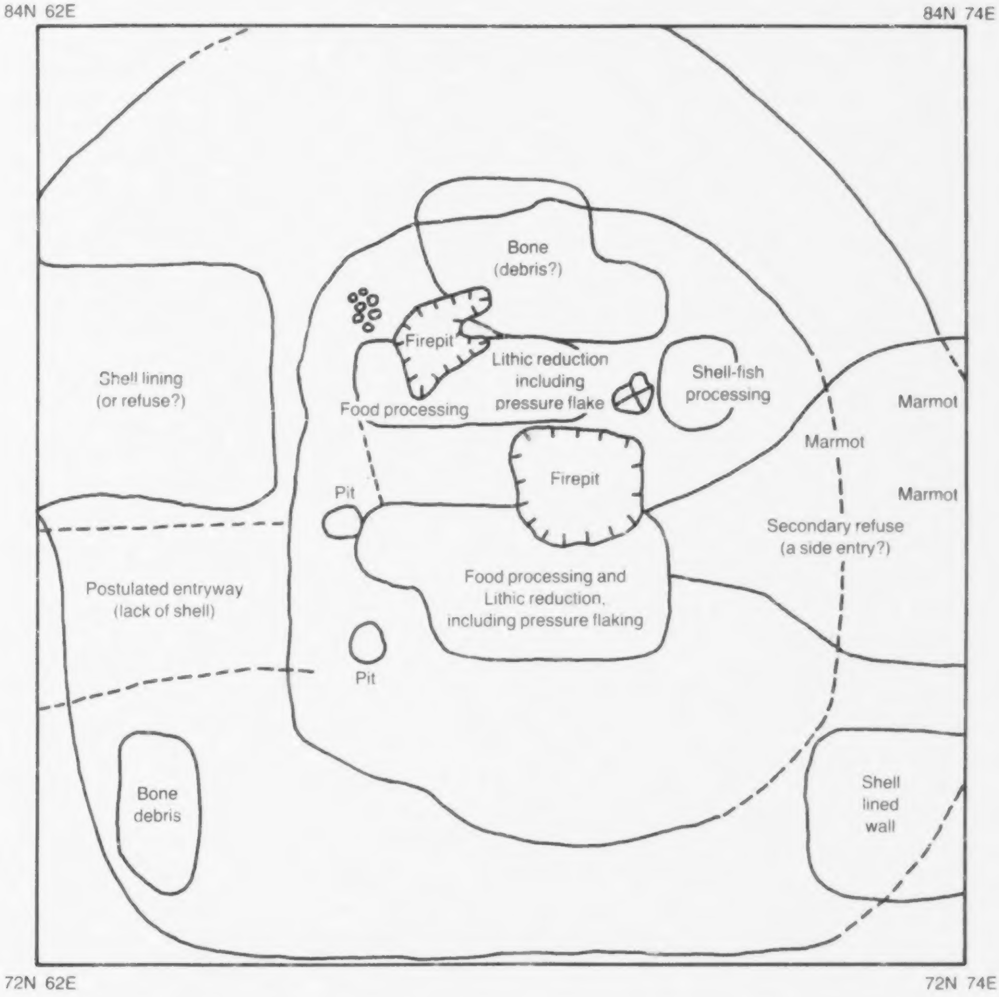

84N 62E
84N 74E
Bone
(debris?)
Firepit
Lithic reduction
including
pressure flake
Shell-fish
processing
Shell lining
(or refuse?)
Food processing
Marmot
Marmot
Marmot
Firepit
Pit
Secondary refuse
(a side entry?)
Postulated entryway
(lack of shell)
Food processing and
Lithic reduction,
including pressure flaking
Pit
Bone
debris
Shell
lined
wall
72N 62E
72N 74E

Figure 6-23. Postulated activity areas, Upper Housepit 1, 45-OK-11.

Lower Housepit 1

Like Upper Housepit 1, Lower Housepit 1 was modified during the course of its occupation. The shell-covered eastern wall was constructed over a more moderately sloping wall and side entryway. Unlike Upper Housepit 1, however, the distribution of tools and debris on the floor of Lower Housepit 1 offers a much clearer picture of possible activity loci.

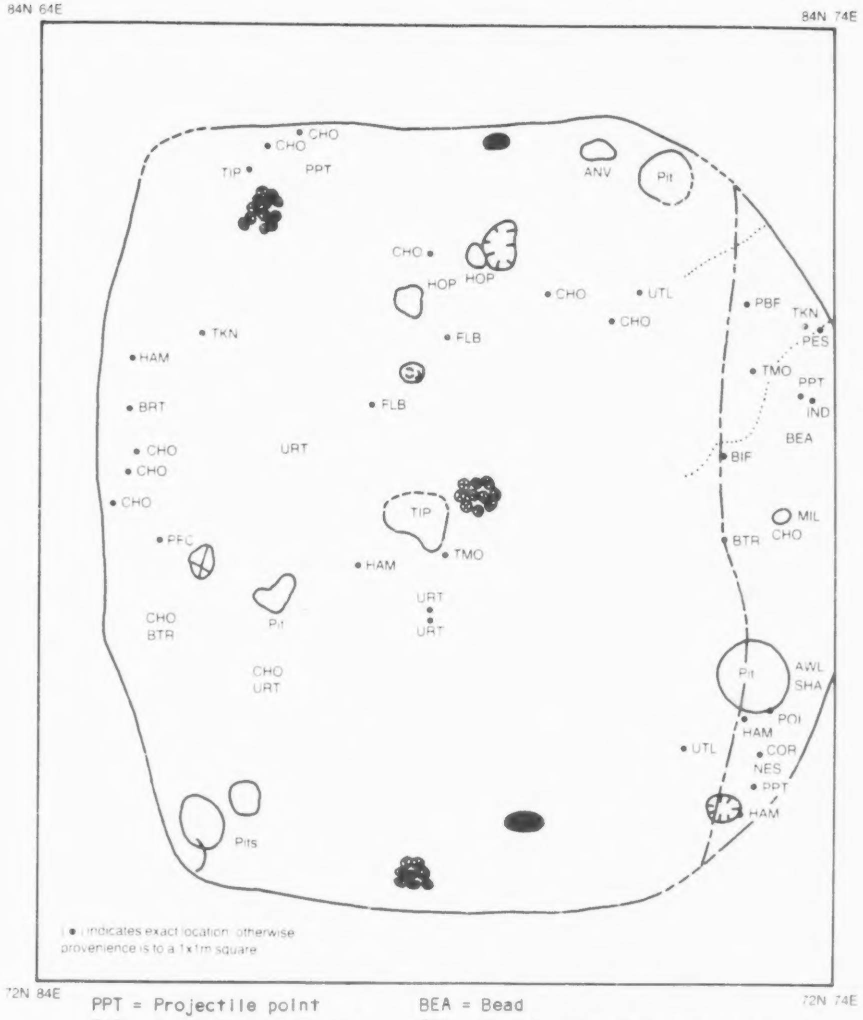
Figures 6-24 and 6-25 depict the location of formed tools and of the greatest numbers of cultural debris. We note that in the northeastern and southern corners of the housepit are several pairs of features consisting of a small firepit and a larger pit. The pits contain relatively large quantities of shell (Table 6-1). Situated near these pit/firepit pairs are fairly dense concentrations of lithic debris, shell, bone, and FMR (Figure 6-25). The assocation between the material concentrations and features is clearest in the southeast corner (Figure 6-26). The high material density in the northeast corner may reflect, in part, the possible side entry in the earlier wall (Figure 6-26), and may not be related in any way to the pit feature or the firepit. We certainly are not suggesting, as Brauner (1976) does for housepits at Alpowa, that family groups can be distinguished in the two groups of material debris and features; the data do not support such an assertion.

Other activity areas can be discerned (Figure 6-26), even though we cannot state who was involved in those activities. The large number of FMR (Figure 6-25) just north of the central pit and the pile of FMR nearby suggest that this pit was a firepit. Southwest of this pit is a scatter of debitage (Division 8), including a few small pressure flakes. A tip was recovered from inside the pit, a hammerstone from just outside (Figure 6-24). Lithic reduction took place here; the firepit perhaps was used for heating the material. Another lithic workshop is indicated by a concentration of debitage in the northwest corner of the housepit (Figure 6-25). A pile of FMR may indicate the former presence of a small firepit in this area. A projectile point tip and two choppers were recovered from within and near the debitage. None show signs of heat treatment.

On the far west side of the housepit is a meat processing area (Figure 6-26). This bone concentration is associated with three choppers, a hammerstone, a tabular knife, and a bifacially retouched flake. A similar assemblage was recovered from the large bone concentration in Area Seven. A plant processing area is postulated in the north-central section of the floor based on the absence of lithics, bone, or shell in the concentration and on the presence of two hopper mortars.

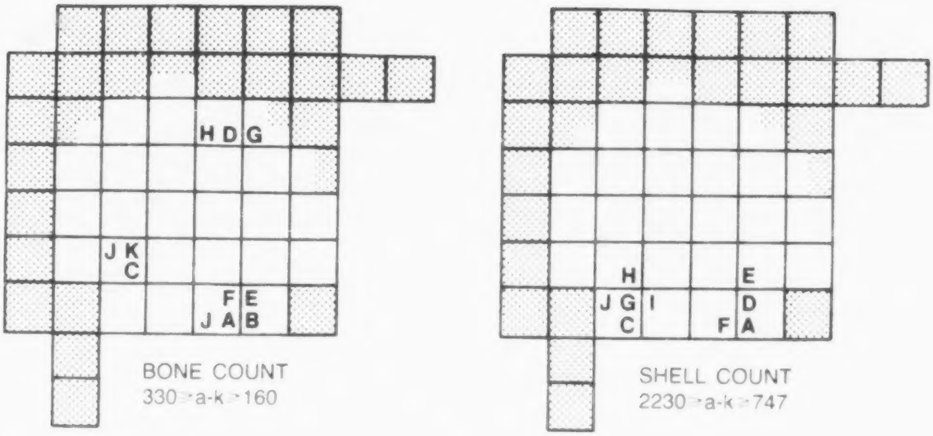
Most of the pits are not clearly associated with any activity. Food processing does not seem to have occurred near them. They may have been cache pits for non-food items.

Three housepits at 45-OK-11 were excavated extensively in hopes of determining activity areas. We have found that each housepit exhibits striking differences in both the nature of the activities that took place inside them and how they were organized; at least, there are striking differences in how these activities are preserved in the archaeological


84N 64E
84N 74E
CHO
CHO
TIP
PPT
ANV
Pit
CHO
HOP
HOP
CHO
UTL
CHO
PBF
TKN
PES
TKN
HAM
FLB
TMO
PPT
IND
BRT
FLB
BEA
CHO
URT
CHO
BIF
CHO
TIP
MIL
CHO
PFC
BTR
TMO
HAM
URT
URT
CHO
BTR
Pit
CHO
URT
AWL
SHA
Pit
POI
HAM
UTL
COR
NES
PPT
HAM
Pits
(•) indicates exact location, otherwise provenience is to a 1x1m square
72N 84E
72N 74E

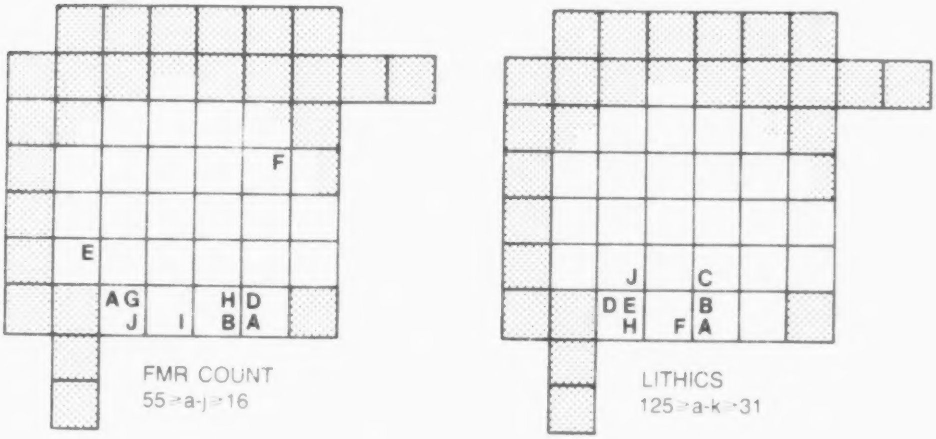
PPT = Projectile point
TIP = Projectile point tip
BIF = Biface
TKN = Tabular knife
CHO = Chopper
PES = Pestle
HOP = Hopper mortar base
MIL = Millingstone
HAM = Hammerstone
NES = Netsinker
SHA = Shaft abrader
AWL = Awl
ANV = Anvil
BEA = Bead
PFC = Peripherally flaked cobble
UTL = Utilized flake
BRT = Bifacially retouched flake
URT = Unifacially retouched flake
COR = Core
PBF = Pointed bone fragment
POI = Bone point
FLB = Flaked long bone
TMO = Technologically modified bone
BTR = Other formed bone fragments
IND = Indeterminate

Figure 6-24. Distribution of tool types, Lower Housepit 1, 45-OK-11. (Symbol "." indicates exact location, otherwise provenience is to 1x1-m square.)


H D G
J K
C
F E
J A B
H
E
J G I
D
C
F A

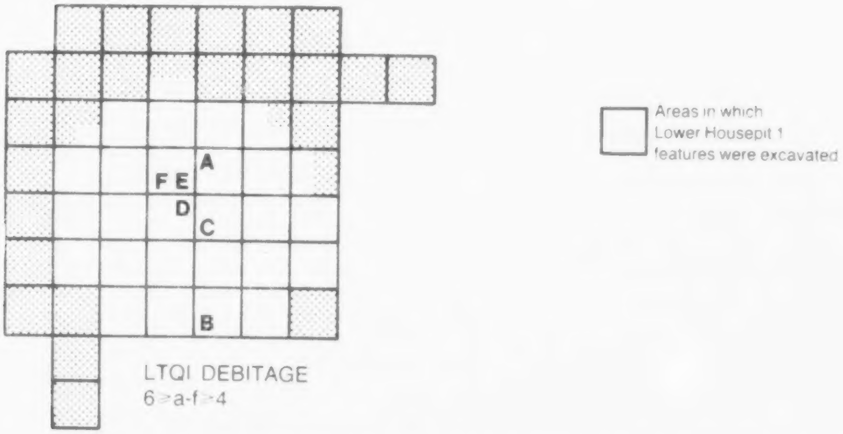
BONE COUNT
330≥a-k≥160

SHELL COUNT
2230≥a-k≥747


F
E
A G
H D
J
I
B A
J
C
D E
B
H
F A

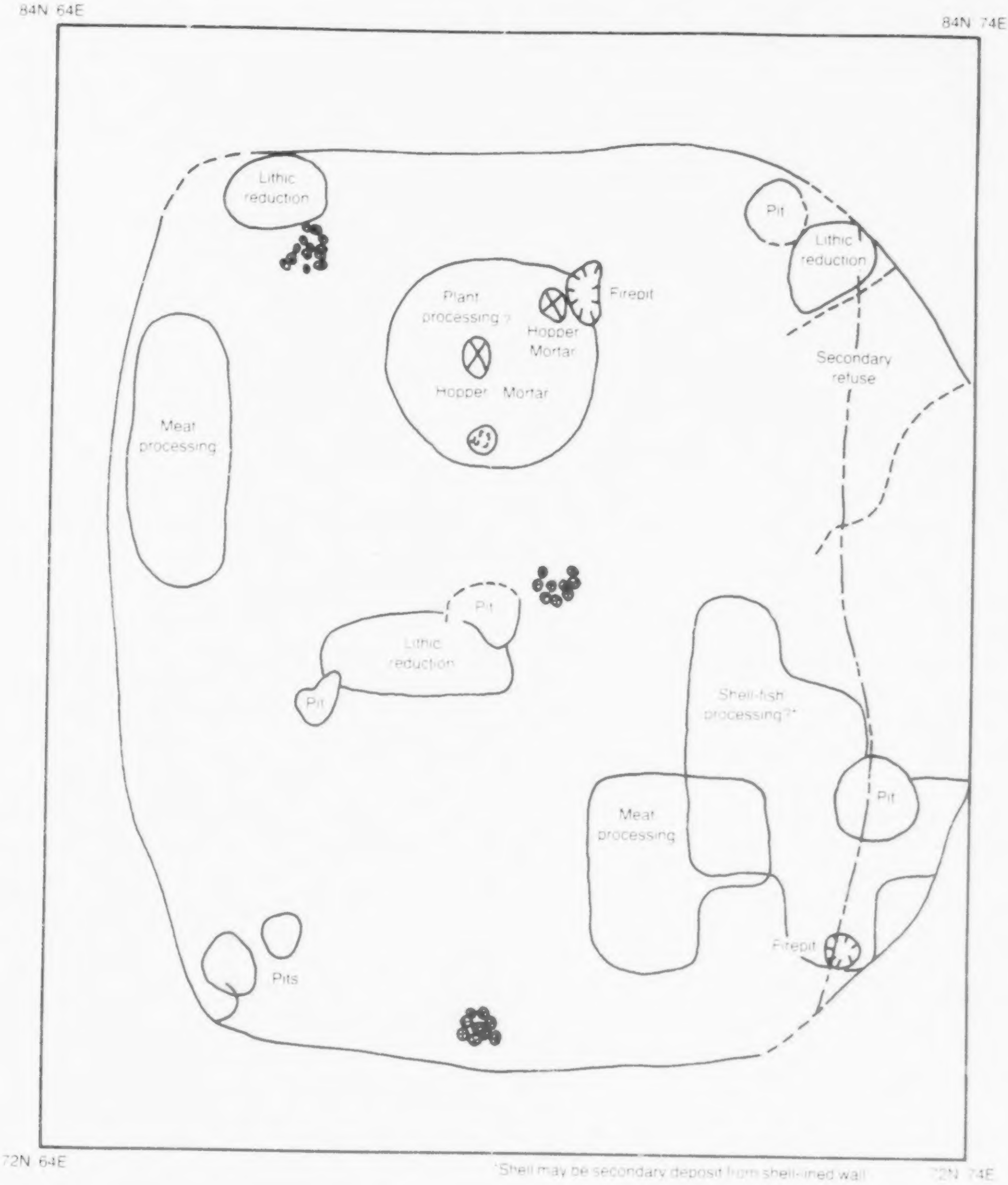
FMR COUNT
55≥a-j≥16

LITHICS
125≥a-k≥31


A
F E
D
C
B
Areas in which Lower Housepit 1 features were excavated

LTQI DEBITAGE
6≥a-f≥4

Figure 6-25. Distribution of material types, Lower Housepit 1, 45-OK-11.


84N 64E
84N 74E
Lithic reduction
Pit
Lithic reduction
Plant processing ?
Firepit
Hopper Mortar
Hopper Mortar
Secondary refuse
Meat processing
Pit
Lithic reduction
Pit
Shell-fish processing?*
Pit
Meat processing
Firepit
Pits
72N 64E
72N 74E

*Shell may be secondary deposit from shell-lined wall

Figure 6-26. Postulated activity areas, Lower Housepit 1, 45-OK-11.

record. Generally, it appears that several activities occurred around a single point, e.g., a firepit, and that specialized activities areas within the housepit were not rigidly established (this seems not to have been the case in later housepits, see Brauner 1976).

Housepits at 45-OK-11 are structurely defined by three feature types--floors, walls, and fill. Many other feature types are associated with housepits all of which also occur outside housepits. As explained previously, unstructured debris concentrations in housepit floors are considered part of the floor. Only firepits and pits were tabulated separately. We now turn to a detailed examination of the artifact assemblages of these five feature types. Tables 6-1 through 6-3 provide the basic information necessary to this analysis.

Housepit Floors

Floors were recorded, with varying accuracy, in all of the housepits at 45-OK-11. They ranged from compacted, intensely stained surfaces to ill-defined, thin sandy strata. Taken together, however, housepit floors consistently yield very high densities of all material, as might be expected. Debitage (Table 6-2) is also abundant on housepit floors. Cryptocrystalline is the largest single material type (40%) represented in the chipping debris, but basalt and quartzite make up the bulk (60%) of the debitage. This 60:40 ratio of basalt/quartzite to cryptocrystalline seems to be fairly common among the Kartar Phase features at 45-OK-11 with some notable exceptions, as we shall see.

The tools assemblage on housepit floors contains a variety of cutting and pounding tools (Table 6-4). Flake tools (utilized flakes, retouched flakes, etc.) make up 26% of the assemblage, similar to the number occurring on exterior living surfaces. Bifacially chipped tools add another 15%, bone tools, 23%. Again, these are roughly the same percentages found on exterior use surfaces. Thus it would appear that the same tool types representing similar activities occur on both interior and exterior surfaces. However, there are two major exceptions to this pattern. The first is the larger number of tabular knives (TKN) on exterior surfaces, which make up 12% of the exterior surfaces' assemblage but only 5% of the housepit floor assemblage. Even more importantly, the several grinding stones which occur on housepit floors comprise 48% of all the grinding stones in features at the site; none occur on exterior use surfaces. The other grinding stones are in housepit fill or on walls. Thus, the large grinding stones are nearly exclusively associated with indoor activities, presumably plant processing.

The density of tool types on housepit floors is always high, no matter what the tool type, but is never the highest (see Table 6-3). Often, an increase or decrease in the proportion or density of tool types in the house floors assemblage is matched by an opposite trend in another feature type. This is especially obvious when comparing housepit floors and walls.

Housepit Walls and Rim

Housepit walls at 45-OK-11 vary from vertical to moderately sloping. Sloping walls contain a great deal of material. However, some of this debris is associated with material originating outside the housepit and may represent refuse spilling into the housepit depression rather than the actual housepit wall. Also, because of the way features were recorded in the field, feature numbers given to certain sections of the walls in Upper and Lower Housepits 1 were continued beyond the rim to the associated surface outside the pit house. Since the shell-covered portions of the walls in these two housepits appeared to be extensions of shell layers just outside the rim, the feature numbers were applied as though to a single deposit. Therefore, we have some mixing of distinct but related deposits, and our "housepit wall" category might be more closely related to shell layers than to housepit activities.

Housepit walls and rims have lesser amounts of bone, but much greater amounts of shell than housepit floors (Table 6-1). This, of course, reflects the several instances of shell on the housepit walls and the shell middens outside the rim from which the shell derived. There are more fire-modified rock per cubic meter than on the floors, but they weigh less. Bone fragments tend to be slightly larger than those on the floors. This suggests that the walls and the area immediately outside the housepit were the target for disposal of trash produced by activities in the center of the housepit--fragmented, unusable rock and larger, unhandy bone fragments, as well as broken shell. The tool assemblage listed in Table 6-4 includes tools recovered from the walls of Housepits 1 and 4 and from the surface just outside the rim. As the maps of the tool distribution clearly shows (Figures 6-19 and 6-21), the majority of tools occurs on the exterior surface. This surface, in the case of Upper and Lower Housepits 1, is dominated by extensive shell middens. The artifact assemblage from housepit rims and walls is very similar to that of the shell midden feature type (Table 6-4) and unlike that of housepit floors, as might be expected.

Only 6% of the tools from the rim area are flake tools. There is also a greater relative frequency of tabular and flaked cobble tools than on house floors. When these numbers are translated into density measurements (Table 6-3), we find that tabular knives and hammerstones both occur at the rate of 1.12 times per cubic meter, or twice the rate for housepit floors. Flaked cobble tools have about the same density per cubic meter as the floor. All other tool types occur in far smaller numbers on the wall than on the floor. When the rim/wall assemblage is compared with shell middens, we find that the combined percentages of large tools--flaked cobbles, tabular knives and hammerstones--are nearly identical: 52% vs. 54%. Other tool types are similar, suggesting functional ties between the two feature types.

This abundance of larger tools on housepit walls and just outside the housepit rims suggests that specific activities involving these tool types took place in these areas. That some activities did take place on or near the wall and just outside the housepits is attested to by the occurrence of a large pit and firepit at the wall/rim juncture in Lower Housepit 1 and of exterior pits originating in the surface contemporaneous with Lower Housepit

1. Based on the very large proportion of basalt and quartzite debitage in this assemblage and on the extremely high density of shell, we infer that these activities may be the manufacture of tabular knives and cobble tools and/or shellfish processing. We also infer the same activities for shell features, given the very similar assemblages between "housepit walls and rim" and shell layers. Having established a connection between the wall/rim deposits and other shell features on the site, we are more confident in calling the shell debris in the housepit walls, "refuse." We judge it is very likely post-occupational trash, although we cannot discount the possibility that it was deliberately placed to build up a new wall or stabilize an old one.

Housepit Fill

Although housepit fill usually contains the largest quantity of all the material recovered from cultural features, the density of material within the fill is very low. For example, while 42% of all stone and bone tools were recorded in housepit fill, tool density is only 1.93 per cubic meter versus 7.2 per cubic meter for housepit floors. Similar decreases in density are shown for other material types as well (Table 6-1). (We remind the reader that cultural features such as shell middens or exterior occupation surfaces, which often occur in housepit fill, have been tabulated separately. The large number of items associated with these features are not used in calculations for "housepit fill.")

The stone and bone tool assemblages from housepit fill are distinctive in contents as well as density. Smaller, more portable objects make up the bulk of the assemblage: flake tools or and formed chipped tools total 51% (Table 6-4). The percentage of broken, worn, or incompletely modified bone tools (22%) exceeds that of carefully crafted bone tools. Large hand tools (e.g., tabular knives, hammerstones and flaked cobbles) are only 16% of the assemblage. Milling stones, although they occur, constitute less than 2% of the tools from housepit fill. The obvious inference from all this is that non-portable objects, such as milling stones and larger tools, tend to occur nearer the place where they were used. Smaller, often more expedient tools, such as utilized flakes, may be more subject to movement and disturbance after their deposition, and occur in greater proportion in the general fill. We note, however, that the density of even small objects in the fill is quite low compared to other feature types. This suggests that small objects, like large ones, also occur more often near their area of use, although they make up a large proportion of the fill assemblage.

Interior Firepits

The five interior firepits recorded at 45-OK-11, all within the Kartar Phase component, range from surficial areas of fire-hardened, orange matrix and rock to small clusters of FMR associated with charcoal staining and burned soil. Dimensions of interior firepits are presented in Table 6-5. Small piles of FMR on the housepit floors may be remnants of other firepits. The maps of possible activity areas within the housepits (see above) show concentrations of bone fragments, small pressure flakes, and formed tools around the firepits. Apparently they were the focus of many of the activities within the structure.

Relatively little material was found within the firepits; the abundant debris around them was collected as part of the floor. Even so, interior firepits displace high densities of material. FMR density is, expectedly, very high, the highest seen among feature types (Table 6-1). Lithic debitage and formed tools also are more frequent in interior firepits than any other feature type, although absolute numbers are rather low. We have already noted that interior firepits often were the focus for stone tool repair and manufacture. The dominance of cryptocrystalline material (69%) in the debitage (Table 6-2) in these firepits reflects the chipping activity around them. The increased number of bone fragments in areas adjacent to several of the interior firepits (see Activity Areas), indicating food preparation, may be mirrored by a similar bone density and the types of tools within firepits. Because only eight tools were recovered, we cannot know if a distinctive assemblage was associatedwith firepits.

Interior Pits

It is difficult to interpret the function of interior pits at 45-OK-11, all of which are from the Kartar Phase component. Nearly all were uncovered within Lower Housepit 1 so we cannot compare the placement or fill of these pits among different housepits. Often interior pits, like oxterior pits, were difficult to define in the field. Although some appear to have been shell-lined (shell is a major constituent of interior pits; Table 6-1), several were nearly empty of cultural debris. Because of the indistinctness of the fill, an excavator might well miss the upper levels of a pit.

In the nine interior pits recorded, only three tools and 27 waste flakes were found. The fill of these pits seems to reflect general debris--large bone fragments, a few, large FMR, a broken, jasper projectile point, a jasper utilized flake, 18 (67% of debitage) basalt flakes, and shell--but in such low density (except for shell) that it seems unlikely that interior pits were dug as trash pits. Maps of floor material show that interior pits are often removed from the dense concentrations of bone, FMR, or shell (see Activity Areas), which suggests that they were not part of food preparation or other daily activities. We conclude that interior pits were constructed for storage, but trash was allowed to accumulate in them after they were no longer used. Those that are associated with firepits, debris, or concentrations (see Activity Areas), however, probably did play a role in food preparation.

EXTERIOR FEATURES

Exterior Firepits

Exterior firepits are recorded in both the Kartar Phase and Hudnut Phase deposits (Table 6-7). The five Kartar Phase firepits, recorded in occupations surfaces in Area 2, and in the fill above Housepit 4 and Upper Housepit 1, contain very little in terms of tools, lithic debitage, or bone (Table 6-1). Firepits have the lowest densities of materials recorded among feature types, with two exceptions. The first, not surprisingly, is FMR which occurs at an estimated frequency of 80 per cubic meter or 13 kg per cubic meter. The second is the very high density of shell hinge pieces (743 per cubic meter), third highest among feature types. (The apparent low density of shell by weight should be disregarded since shell weight was not recorded for several features.) From this limited evidence, we infer that most, although not all, of the Kartar exterior firepits were used to cook shellfish by radiant heat.

The 12 firepits of the Hudnut component are virtually empty of shellfish remains. Instead, they probably were used for cooking meat and for burning trash. Bone density, while low compared to Kartar feature types, is the highest of Hudnut feature types (Figure 6-11). Debitage and tools are of moderate density relative to Kartar Phase features and show no discernible pattern (except that in the Hudnut Phase, cryptocrystalline dominates all lithic detritus).

Since the density of FMR in Hudnut Phase firepits is twice that of Kartar Phase firepits and since the bone fragments are much smaller, we suggest that technological changes occurred in the method of firepit construction and in the manner of food preparation from the Kartar Phase. The Kartar Phase occupants probably re-used FMR in successive fires.

Exterior Pits

The seven exterior pits recorded for the Kartar Phase (Table 6-7) vary in size and shape. Usually circular, they range from 30 to 125 cm in diameter (Table 6-5). They were not very distinct and often were not recognized in the field until the lower portion, which contained the limited material found in the pit, was reached. None of the exterior pits are obviously associated with an exterior occupation surface, nor do they appear to have been shell-lined as were some of the interior pits. Like interior pits, exterior pits show very low densities for all material. Whatever their original purpose, they were cleaned out by the aboriginal occupants. Sometimes camp trash was tossed into the bottom of the pit after its contents had been removed, and the rest of the fill accumulated naturally.

Exterior Occupation Surfaces

Two major living surfaces, in Areas 2 and 3, and several smaller ones were identified for the Kartar component. Some of the bone scatters, especially the bone concentration in Area 7, also may be considered occupation surfaces, but we treat them separately because of their special use.

In Occupation Surfaces A and B, a three-tiered spatial distribution of material was noted. Each contained a central portion in which charcoal and organic staining was intense and the amount of material high. A peripheral zone surrounding the central zone also containing a great deal of material but lacking the intense staining of the central zone. In both Occupation Surfaces A and B, these two zones lay in a very shallow depression (see Figures 6-5 and 6-7) which were either excavated or compacted through use. In either case, we might postulate simple structures built over these occupation surfaces, perhaps ramadas for summer use.

Generally, the density of material is less on exterior living surfaces than on housepit floors. Bone and lithic debitage are exceptions. Debitage density is the second highest among feature types (Table 6-2). The ratio of cryptocrystalline to basalt/quartzite is 47:52. The density and ratio are skewed by Occupation Surface B which contained debitage at an average density of 858 per cubic meter (including a well-defined chipping area) of which about 60% were cryptocrystalline.

The tool assemblage from exterior living surfaces is very similar to that from housepit floors. Compare (Table 6-4), for example, the proportion of flake tools (27% vs. 26%), chipped stone tools (17% vs. 15%), pieces of modified bone (14% vs. 15%), and flaked cobble tools (18% vs. 19%). Slight differences in the activities occurring on the exterior surfaces are suggested by the higher proportion of tabular knives (12% vs. 14%), fewer formed bone tools (4% vs. 8%), and the near lack of milling stones. The density of bone from exterior surfaces is nearly twice that of interior ones. It may be that more or more frequent meat processing accounts for the subtle differences in the tool assemblage.

EXTERIOR DEBRIS CONCENTRATIONS

These are concentrations, scatters, or clusters of debris which often are not associated with a clearly defined surface. Some may represent in situ activity areas (e.g., the Bone Concentration in Area 7); others may be midden deposits. Often these concentrations are distinguished by a predominance of either shell, bone, or FMR. Mixed debris concentrations, are ones in which no one material type stands out.

Shell Concentrations

Shell concentrations, confined to the Kartar component (Table 6-7), range from discrete clusters to thick layers of shell and debris. Expectedly, shell density is higher here than in any other feature type (Table 6-1). The density of bone fragments and FMR is also quite high which may indicate use of the areas as trash dumps. Densities of debitage and tools are moderate (Tables 6-2 and 6-3). Most of the debitage is either quartzite (54%) or basalt (25%), which correlates with the high percentage of heavy quartzite and basalt tools.

The tool assemblage is dominated by coarse chopping and pounding tools (54%), especially tabular knives (24%) and choppers (21%). These are higher proportions than expected if shell middens contained only general camp trash and suggests that these types of tools are used in shell processing. The corresponding presence of the same lithic material in the debitage also argues for the manufacture and use of these tools in these areas, which are later used for the disposal of bone, FMR, and other debris. If this line of reasoning is sound, careful stratigraphic excavation of shell layers in the future should reveal a compact surface containing coarse tools at the bottom with general debris on top. The superimposition of shell middens over exterior pits in two instances in Area One is preliminary evidence for an activity surface underlying the shell layers.

We should note in passing that, while tabular knives make up a large portion of the shell layer's tool assemblage, they are not confined to or exclusively associated with shell. Over one-third of the tabular knives recorded are found on housepit walls or floors; another 21% occur on exterior living surfaces. Thus, while shell layers contain a high percentage of tabular knives, the knives are just as often found in other feature types.

Bone Concentrations

Bone concentrations are confined to the Kartar component (Table 6-7). This feature type includes the features within the Bone Concentration of Area 7, as well as other, more limited features.

Bone concentrations appear to represent special activity areas, even though compact surfaces are seldom noted. Unlike shell layers, they do not seem to have been used as dumps. Bone density is nearly five times that of any other feature type; tool density is the highest recorded, and debitage is also fairly high (about the same as housepit floors). Only shell is found in lower amounts than in other feature types.

Seventy-two per cent of the debitage in bone concentrations is cryptocrystalline (Table 6-2), although only one-third of the tools are of this material. Another third of the tools are quartzite and basalt. When we compare these percentages with those characteristic of housepit floors, we find that on the floors about the same number of tools are cryptocrystalline (31%), but that only 39% of the debitage is. On exterior occupation surfaces, 43% of the tools, but only 47% of the debitage is cryptocrystalline. This suggests that there is more resharpening or manufacture of cryptocrystalline tools in the bone concentrations than in the other feature types. However, there are very few chipped stone tools recovered from bone scatters, the majority of tools being tabular knives, hammerstones, choppers, and utilized flakes. It may be that the goal in producing so much cryptocrystalline debitage was to produce suitable flakes for immediate use. If the debitage was from the manufacture or maintenance of more carefully crafted tools, then these tools were not discarded here. Although the density of tools in bone concentrations is high, the absolute number is fairly small (22). It remains to be seen whether the patterns outlined here will be borne out by analysis of additional samples of this type of feature in the project area.

Fire-modified Rock Scatters

No scatters of FMR were recorded in Kartar Phase deposits, although several extensive scatters occurred in the Hudnut component (Table 6-7). These often occurred within the shallow depressions above the filled-in housepits.

Bone density is lower than expected (Table 6-1) if butchering was a primary activity at the Hudnut encampment. Shellfish are, of course, extremely limited in number. Only in the density of lithic debitage and formed tools does this feature type equal Kartar feature types; in the density of FMR, it far exceeds them. Although the number of tools is limited (12), a wide variety is present, including a bone point, a graver, and a scraper.

Until this particular feature type can be compared with other Hudnut feature types from other sites, we cannot say what this variety of tools and the other attributes mean. Nor can we tell what specific activities these large scatters represent, other than the dismantling or erosion of rock-filled or rock-lined firepits. Our comparison of densities and assemblage percentages with Kartar features tells us more about what these FMR scatters are not than about what they are.

OTHER

Four other feature types were recorded at 45-OK-11: stains, cultural strata, an FMR concentration, and lithic concentration. Minor categories of uncertain significance, they will not be discussed in detail here. These feature types have greater importance at other project sites and may assume greater importance here.

REGIONAL COMPARISIONS AND CONCLUDING REMARKS

Sixteen feature types are defined at 45-OK-11. Around 5,000 years ago, pit houses were constructed at 45-OK-11. The evidence suggests that three or more housepits may have been contemporaneous, and the pattern of semipermanent occupation continued at the site for the next thousand years. The pit house occupation was followed by an open encampment during the Hudnut Phase. Two are exclusive to the Hudnut Phase; 14 occur in the Kartar component. Only exterior firepits are found in both. This dramatic difference in feature types underscores an equally dramatic shift in site use between 4000 and 3000 years B.P. .cp 3

Aside from a few housepits excavated in the Snake River drainage (Ames et al. 1981; Brauner 1976), the eleven housepits at 45-OK-11 are the major body of evidence of semipermanent settlements on the Columbia Plateau dating from 5,000 years ago. The existence of housepits at 45-OK-11, as well as their material assemblages, which are assigned to the Kartar Phase, must cause Plateau archaeologists to rethink the artifactual criteria for their phase definitions and the prehistoric socio-economic patterns which produced the archaeological record. Ames (et al. 1981) and Brauner (1976) have drawn conclusions about subsistence activities and the development of semipermanent settlements which the data recovered at 45-OK-11 call into question. This problem, touched on here, is discussed more fully in the concluding chapter.

Ames et al. (1981) document two building episodes at Hatwai during the period when 45-OK-11 was occupied. House 6, Floor 1 represents the first phase of building. Dated to 5050±320 B.P., this was a simple pit with 45 degree walls (House Type II). Most of the structure lay under Highway 95 and was not exposed. A second phase of building spans the same time as the Kartar and Hudnut components at 45-OK-11, from 4300 to 3440 B.P. Three or four houses are dated to this phase of building. House 1 is of House Type I--subrectangular with a 2-m wide annular bench. House 2 contains two floors and is a simple pit without a bench, and with walls at 45 degrees--much like House 6 at Hatwai and the housepits at 45-OK-11. Houses 5 and 7, which are simple pits, also may date to this period. These houses are 70 to 100 cm deep. A Cascade Phase house at Alpowa (Brauner 1976), dating to 4060±130 B.P., was circular, about 40 cm deep. Thus, we see that variation in housepit construction--in depth and shape--is the norm between sites (like Alpowa and Hatwai) as well as within a single site (like 45-OK-11). We cannot say yet what temporal significance, if any, this variation may have. It may be that later housepits will exhibit less or more variation in these attributes. However, at this point, we cannot say that the attributes of size or shape are temporally diagnostic.

In some ways, other than construction details, the housepits at 45-OK-11 are very different from those recorded along the Snake River and these differences will influence interpretations of cultural change on the Columbia Plateau. For example, Brauner uses the paucity of food bone and the pairing of hopper-mortar bases and anvils at House 5, 45-AS-82, to suggest a heavy reliance on stored foods, especially roots and dried meat, during the Cascade Phase. During the succeeding Tucannon Phase (4000-2000 B.P.), at least two houses were constructed at Alpowa, and the site was used more extensively. The faunal assemblage for both phases was small, indicating "that fresh protein was a dietary adjunct, not mandatory for winter survival" (Brauner 1976:301). The opposite appears to be true at 45-OK-11 where food bone remains are fairly dense within the housepits themselves, but especially on exterior activity surfaces and butchering areas (i.e., the bone concentrations), during this same period.

Ames et al. (1981) also emphasize the importance of root crops, especially in the Tucannon Phase, indicated by the presence of grinding implements at Hatwai. No shell concentrations and only one large bone feature were recorded there. This is a marked contrast to the several bone scatters and shell features recorded at 45-OK-11. Clearly, although the same types of structural features occur at all three sites--housepits, storage (?) pits, and firepits--the resource base for the three communities appears to have been very different. Ames and Brauner may be correct in their emphasis on stored foods and root crops as the major factor in the development and maintenance of semipermanent villages along the Snake River. During the same time period, similar settlements were established along the Columbia River, presumably by similar processes, but supported by a different balance of resources.

SYNTHESIS

The two cultural components of 45-OK-11 span an interval from about 5400-2800 B.P. The earlier, Kartar Phase, component that contains both housepits and extensive activity areas, is made up of numerous occupations dated to the period from 5400-4200 B.P. Seasonal indicators document year-round activities. The later, Hudnut Phase component, on the other hand, has no structured cultural features except for isolated firepits. Three radiocarbon dates place the component in the period 3900-2800 B.P., while seasonal indicators document late spring and early to mid-summer activites. The Kartar and Hudnut Phase designations correlate with the Cascade and Frenchman Springs Phases on the Middle Columbia River (Nelson 1969) and Cascade and Tucannon Phases on the Lower Snake River (Leonhardy and Rice 1970).

Housepits in the Kartar Phase component date between 5100-4200 B.P., which matches the earliest known occurrence of semi-subterranean dwellings on the Columbia Plateau (Brauner 1976; Ames et al. 1981). The Kartar Phase assemblage contains typical Cascade and Cold Springs Side-notched projectile points, evidence of Levallois-like blade production, a varied cobble tool industry, and an extensive bone tool industry. This corresponds to previously defined characteristics of the Cascade Phase (cf., Nelson 1969; Leonhardy and Rice 1970; Bense 1972). However, it also yielded some distinctive elements: the newly defined Mahkin Shouldered and Nespelem Bar projectile points and a sizeable flake tool industry. The presence of these later diagnostics in the Kartar Phase assemblage may well indicate that this site assemblage has a direct transitional relationship to the later Hudnut Phase.

Floral and faunal remains indicate year-round occupations during the Kartar Phase. Tool assemblages document activities geared to hunting, plant and shellfish collection, and fishing. Taken together these lines of evidence show a generalized hunting and gathering exploitative system organized around a maintained settlement. This reconstruction thus contradicts prior hypotheses envisioning human societies during the Cascade Phase as composed of far ranging hunters and gatherers, who travelled across the landscape in small family units to exploit seasonally recurrent resources (cf., Bense 1972; Rice 1974). At 45-OK-11, a number of related families were living in a permanent settlement. The year-round maintenance of this base, together with floral and faunal evidence that both riverine and upland resources were exploited, indicate an economic system operating within a defined territory. Therefore, we must revise previous postulates about the nature of socioeconomic organization during this period. Further, the transitional character of the Kartar Phase assemblage suggests that the change from the Kartar Phase to the later cultural phase was not rooted in basic shifts in human adaptive strategy, and that societies in the two periods were historically linked. This challenges many authors who envision extensive dislocations in the cultural systems (cf., Browman and Munsell 1969; Nelson 1969, 1973; Leonhardy and Rice 1970; Brauner 1976; Ames and Marshall 1981).

By noting affinities between the Kartar Phase assemblage and that currently defined for the Cascade Phase, we do not intend to posit any direct cultural connections. Rather, we intend to place the site assemblage in a regional context by correlating diagnostic traits within the spatial/temporal construct of the cultural phase (Willey and Phillips 1958; Leonhardy 1968; Bicchieri 1975). The site assemblage is not identical to those described by Nelson (1969) or Leonhardy and Rice (1970) for a similar temporal period, nor is it fully described by these authors in their definitions. Our designation, the Kartar Phase, is meant to signal the unique character of the cultural sequence in our study area.

Yet, with this said, the 45-OK-11 Kartar Phase artifact assemblage is more like the Cascade Phase assemblages than different, and both are distinct from assemblages marking earlier and later cultural phases. We accept the diagnostic indicators that correlate the Kartar Phase assemblage with the Cascade Phase, and, in so doing, force revision of prior cultural reconstructions which advocate unquantifiable shifts in the nature of cultural adaptation embodied in the definition of a Cascade Phase versus a Tucannon or Frenchman Springs Phase. We intend to call into question interpretations that rely on trait composition to signal shifts in human adaptive strategy. The work at 45-OK-11 supplies additional evidence that while defined trait lists are good temporal indicators, they cannot be used to define socioeconomic organization.

KARTAR PHASE COMPONENT

A total of 164 cultural features were defined for the earliest component. Eleven housepits were exposed, three completely, eight partially. Fifteen occupation surfaces were identified, several containing firepits, bone concentrations, chipping stations, or miscellaneous pits. Three bone concentrations were defined distinct from occupation surfaces, and 17 shell concentrations were exposed throughout the site matrix.

Several poorly defined occupation surfaces with diffuse lithic, shell, and bone scatters represent the initial occupation, at or before 5400 B.P. Cultural activity occurred on the soft, sandy alluvium laid down just above glacial drift. At this time, the river level was nearer the site elevation than now. Alluvium from the mouth of nearby Hudnut Creek and slack water deposits from lateral accretion of the Columbia River formed the site deposit. Shortly thereafter, perhaps within as little as two hundred years, housepits were constructed on the site. We have abundant evidence--numerous occupation surfaces and lithic, bone, and shell concentrations--that cultural activity increased at this time.

The site stratigraphy is marked by the overlapping of innumerable, thin cultural deposits representing many undefined activity areas. Alluvial deposition continued and ponded water from the river still occupied sections of the site near the river channel. Sometime before 4000 B.P., the river channel began to migrate to the south and incise deeper. The vegetation communities were probably very similar to those of today (cf., Dalan 1979; Leopold and Nickmann 1981), although faunal and floral remains indicate a moister site environment. Yet pollen cores from Goose Lake indicate that the period before 4000 B.P. was drier than that from 4000 B.P. to the historic period. It would seem likely, then, that this moister environment was a very local phenomenon, perhaps tied to a higher river level which resulted in a higher water table and sloughs standing along the site's margin. The proximity of the river may also explain the higher proportion of coniferous species in the Kartar Phase assemblage--inhabitants may have collected driftwood from the nearby shore for building material and fuel.

From their stratigraphic position and associated radiocarbon dates, we infer that no more than three or four of the exposed housepits were occupied at a time. We can define at least three separate housepit occupations. The earliest includes lower Housepit 1 and Housepit 3, and is perhaps associated with the Feature 185 and Feature 122 activity surfaces. Housepits 2, 6, 11, 12, and upper Housepit 1, follow shortly thereafter; they are associated with the occupation surfaces, Features 155, 51, and 141 and the Area 7 bone scatter. Housepits 4 and 5 appear to have been constructed soon afterward. Given the distribution of associated radiocarbon dates, and the tight stratigraphic associations in the Area 5/6 and Area 4 excavation blocks, we can speculate that these occupations occurred within a short interval--perhaps 100-200 years or less (cf. Figure 2-14). The stratigraphy in block 5/6, where Housepits 11 and 12 are sandwiched between Lower and Upper Housepits 1, and the radiocarbon dates from floors and fills span less that 350 years, certainly would bear out this speculation. The Upper and Lower Housepit 1 fills exhibit multiple activity surfaces, indicating continued use of housepit depressions: the site must have been occupied during this entire period. Of course, we cannot know if there were housepits during all these occupations, nor if the nature of the site use and the season of occupation remained the same; yet the tool, floral, and faunal assemblages are so constant in character that we suspect that changes in site use amounted to nothing more than the rearrangement of dwelling locations.

We have noted that the Kartar Phase site economy was broad-based. Large animal species--especially deer, but also mountain sheep, antelope, elk, and bison--formed an important part of the occupant's diet. Numerous bone scatters reveal the effort devoted to the hunting and processing of game. The most extensive of these is the Area 7 concentration--there, complete carcasses were butchered and processed for meat, hides, and marrow. Most of the bones are highly fragmented, presumably crushed for marrow extraction. They lie in clusters about a large central area which yielded anvils, choppers, hammers, and a greasy, organically stained matrix. The fragments are chiefly deer or deer-sized; some elk and mountain sheep elements (represented only by jaws, teeth, and bits of skull) also occur.

The large size of the bone scatter (>36m2), the number and variety of animals present, and the pattern of organized processing, suggest a cooperative effort, perhaps members of several related families acting as a specilized task group. The confined nature of the deposit and clear patterning in artifact distribution, which suggest that this activity was a single event, support this scenario.

The hunting groups would not have needed to range far for these game species--they may have been taken by the river, in the uplands to the east, or the escarpments to the west. Winter probably forced the animals down to lower elevations and so brought them yet nearer to the site, making procurement easier. Hunters did foray into the upland forests, as we may infer from the grizzly bear and marten elements in the site assemblage. Elements of hares, ground squirrels, and porcupines preserve evidence of local hunting. Numerous rodent elements, which, for the most part, lack signs of butchering or charring, may indicate that small rodents were consumed; we cannot, however, rule out natural deposition. Turtles, represented by numerous burned shell fragments, seem to have been a handy local food source. This varied faunal assemblage attests to year-round site activities: deer ages indicate year-round consumption, antelope were taken in the fall and winter, and marmots in the spring and turtles in the spring and summer.

The Kartar Phase occupants of 45-OK-11 intensively exploited river mussels as well. The occupation surfaces frequently yielded large concentrations of shell, and the housepits and living surfaces commonly exhibit one or more small clusters. When recovered in small concentrations, the shells are usually unbroken and uncharred. We infer from this that mussels were a favorite food--either eaten raw or steamed, since charring is uncommon. When exposed as middens, however, they are often fragmented, charred, and mixed with artifacts and bone debris. Apparently, discarded shells were swept out of housepit floors and cooking areas, mixed with other refuse, and deposited in the large site dumps. The extensive shell middens lining some housepit depressions caused excavators to speculate that shell was deliberately used to line housepit walls, perhaps to shore the soft, sandy matrix. However, it is more likely that the inferred linings are simply layers of discarded shell. Three facts support this interpretation: the presence of well-defined walls behind the shell linings, the routine use of housepit depressions for trash disposal, and the presence of artifacts and bone debris among the shells. This would suggest that the shell was not used for wall shoring unless we assume that inhabitants were using general trash as the lining material.

River mussels are found in large, dense beds in relatively shallow, quiet water. Emphasis on this resource during the Kartar Phase would be in keeping with our conjecture of a shallow, gradual river margin near the site, perhaps as part of the system of sloughs postulated earlier. Certainly, large, rich beds must have been present nearby. Little information on the harvesting of river mussels is available, but it seems likely that they would have been accessible year round. Ethnographic sources state that shellfish supplemented the diet in the spring when winter supplies were low and most plant resources were not yet available (cf., Ray 1932; Nelson 1973). Mussels were an important supplement at this site during the Kartar Phase, perhaps even a major part of the diet. Comparable data on the importance of river mussels in the diet of Cascade Phase and Windust Phase populations has been obtained from a number of early sites. Rice (1969, 1972) and Leonhardy and Rice (1970) conclude that large game hunting and shellfish collecting were the major aspects of the prehistoric economy at Marmes Rockshelter.

Site inhabitants also practiced fishing. Fish skeletal parts and diagnostic artifacts, however, are not common in comparison with elements of terrestrial fauna and artifacts indicative of hunting. Cyprinidae (suckers and minnows) elements are twice as common as Salmonidae (salmon, trout and whitefish) elements; the latter, however, do not preserve as well because of their delicate bone structure. The salmonid vertebrae are more often fragmented and burned, perhaps indicating a different manner of preparation and consumption. In housepits, fish remains are about equally distributed in fill and wall material. On housepit floors and external living surfaces, Cyprinidae elements predominate. Other cultural features contained few fish remains. The small fishing artifact assemblage includes barbed harpoon point fragments, a composite harpoon valve, a variety of bevelled and unbevelled bone and antler points, sharpened bone splinters, and several net weights. The bone points and splinters may not be parts of fishing gear, although they resemble elements described by Stewart (1977), and do not seem to correspond to other more common bone tool forms. Clearly, fish were taken and consumed, but their importance in the diet is difficult to ascertain.

The greater proportion of minnows and suckers than salmonid remains in the faunal assemblage indicates fishing in the shallows of the river, possibly with hook and line, but more likely by netting and spearing. This may well have been an individual activity, requiring little, if any, group cooperation. If salmon had been taken in the large numbers described for aboriginal populations historically, and documented prehistorically (Cressman 1960), we should expect more evidence in the faunal and artifact assemblages. Of course, we must temper this expectation, taking into account the effects of different methods of food preparation as well as the probability of poor preservation for salmonids. If salmon were filleted and dried prior to consumption, the likelihood of preservation of skeletal parts would be further increased. Also, if seasonal salmon runs were better exploited elsewhere along the river, it would be likely that the faunal and artifact assemblages at 45-OK-11 would not reflect the actual investment of labor and the importance of salmon in the diet. We may conclude only that fishing was not a primary activity at the site, although its importance may be underestimated.

The Kartar Phase occupants of the site also exploited a wide range of plant species for food, fuel, and material for dwellings and artifacts. The botanical assemblage is composed of edible and non-edible species: by weight, 83% conifer, 6% hardwood, 2% edible material, and 9% herbaceous material. The conifers include yellow pine, ponderosa pine, Douglas fir, and larch. All of these species, with the exception of ponderosa pine, which occurs as isolated stands at lower elevations, are now found in the uplands flanking the site to the east. Their occurrence at the site could indicate these species were growing at lower elevations before 4000 B.P. or that site inhabitants may have transported them down to their settlement. It seems most likely, however, that the river was carrying driftwood from higher elevations upriver, and that the site inhabitants were scavenging it.

Of the hardwoods, bitterbrush is the most prevalent. Recovered edible materials include three charred goosefoot seeds, a single serviceberry seed, and charred lomatium tissue. Among the recovered herbaceous materials are rye grass stems and leaves and an unidentified fiber thread. The fruit seeds and charred lomatium tissue were recovered from the floor of Upper Housepit 1, grass stems and leaves from the Upper Housepit 1. The botanical seasonal indicators, e.g., various grass florets, lomatium tissue, and a wild strawberry seed, indicate activities in the late spring to early summer.

We cannot readily assess the importance of plants in the site economy. A lack of caches or identified storage features, and comparatively few tool types related to plant processing may indicate that plant collection was less emphasized than hunting. On the other hand, mortars, hopper mortar bases, and pestles from housepit floors, external living surfaces, and general site fill, do indicate that plants were processed and consumed at the site. Plants may indeed have provided a significant part of the inhabitants diet: plant processing tools need not be as numerous as those used for hunting and processing of game, since ground stone tools do not wear out as quickly as the edged tools used for butchering.

Activity patterning on the site is marked by a high degree of consistency. Plots of the location of tools and wear types and floral and faunal remains indicate that a similar range of activities occurred on housepit floors, external living surfaces, and throughout the general component fill. Housepit floors and external activity surfaces were the scene of butchering, food preparation, cooking, tool repair and manufacture. According to seasonal indicators, they were used throughout the year. This year-round use of housepits contradicts prior postulates linking housepits exclusively with "winter villages" (cf. Daugherty 1962, 1973; Nelson 1969, 1973). Chopping and pounding tools occur frequently on housepit floors in association with faunal remains, indicating that primary butchering was done within the dwellings as well as on the external living surfaces, perhaps as a consequence of inclement weather. Yet the artifact density is less on the housepit floors than on the external surfaces and in the component fill: although the same range of activities probably occurred in the dwellings, it seems likely that most activity took place outside the dwellings whenever this was feasible. The relative cleanliness of house floors at 45-OK-11 is unusual when compared to Hudnut Phase and Coyote Creek Phase housepit floors in the Rufus Woods Lake project area (Sammons-Lohse 1984), and the single comparable house floor exposed by Brauner (1976) at Alpowai. The 45-OK-11 dwellings were either not used as intensively or were regularly cleaned or carefully collected upon abandonment. All three scenarios probably apply.

The scarcity of storage pits and structural features other than firepits on housepit floors also indicates that considerable activity was focused outside of dwellings. Few housepits contained pits of any kind; Lower Housepit 1, which contained seven pits and two firepits, is an exception. When present, internal pits are indistinct or unremarkable. Commonly, they contain a few broken or charred bones, some chipping detritus or flake tools, and variable quantities of shell. We cannot be sure whether identified pits functioned as storage or waste pits, or both. None contained material which we can assume was stored. The pits certainly represent activity foci, where processed foodstuffs could be stored or where debris might be dumped. If housepits were the favored locations for activities, particularly in the winter months, we would have expected more storage and waste pits in house floors. That pits occur infrequently on house floors, and are about equally distributed inside and outside of the dwellings, seems to indicate that activities took place outside of the housepits whenever possible.

We may have evidence of more than one kind of dwelling at 45-OK-11. While housepits are easily recognized, shallow, mat or brush-covered surface structures would not leave such conspicuous traces. It could be that some of the activity foci outside the housepits represent such structures. Admittedly, the evidence is meager: external activity surfaces with firepits, miscellaneous pits, and well defined bowl-shaped living floors with a variety of tool and faunal element clusters (e.g., Occupation Surfaces A and B). Faunal seasonal indicators place use in all seasons of the year, just as in the housepits. Such structures could house families in the warmer months when the semi-subterranean dwellings would have been unnecessary or uncomfortable. They may have been used on clear days in the colder months, with a windbreak or ramada-like roof; or, possibly, they represent the same household unit as the housepit, were used for identical activities, but were constructed differently. We can only be sure that these floors closely resemble the housepit floors, and exhibit evidence of the same range of economic tasks undertaken throughout the year. If these living floors do represent dwellings, their associated pits in conjunction with those from the defined housepit floors, represent a pattern of enclosed activity foci more like that which we might have expected, particularly in the winter months.

We have no clear indications of the social composition--number and relationship--of dwelling inhabitants. The internal arrangement of structural features may provide cluse to group composition, particularly as these suggest the distribution of tasks and the organization of labor. Brauner (1976), for instance, argues that we can extrapolate from the number, kind, and arrangement of floor features the size and composition of the dwelling group. At Alpowai, he found a recurrent pattern of paired firepits, milling stones, and discrete activity clusters on housepit floors which led him to conclude that at least two related families shared the same structure. The pattern at 45-OK-11 is far less distinct, however, and lacks the significant pairing of cultural features. The firepits are usually unprepared shallow basins, with or without fire-modified rock, often seen only as charcoal-stained areas of oxidized sand on the housepit floor. Most floors have several of these burned areas distributed randomly over the living area, suggesting shifting locations for the firepits and a flexible organization of the interior living space. Artifact patterning does suggest that firepits were the primary focus of activity. In at least one housepit, a storage or waste pit was dug immediately adjacent to the firepit. In most, milling stones and anvils, and discrete clusters of artifacts occur around a centrally located hearth. In those dwellings with entryways (Lower Housepit 1, Upper Housepit 1), activity areas cluster quite near the entrance as well as around the firepit, probably to take advantage of the light and warmth flooding the doorway.

Several housepits (Upper Housepit 1, Lower Housepit 1, Housepit 4) exhibit redundant activity patterns, evidence of either consistent use over a very short period of time or complementary activities reflecting shared tasks by cooperating individuals. For example, the thick floor of upper Housepit 1 shows recurrent, overlapping distributions of small butchering and hide processing tools as well as debitage from tool manufacture, indicative of reuse of a single surface. Lower Housepit 1, on the other hand, has a clearly defined plant processing area with two hopper mortar bases, which is perhaps evidence of two cooperating individuals. If we take these patterns as indicative of cooperation rather than task separation or simple reuse, we might, given the large size of the dwellings, speculate that we have evidence or two or more women and providing males in each structure (cf., Brauner 1976). Such an inference is tenuous at best, however, and we must relate the meager evidence we have to some more realistic estimate of population size and social organization.

We can estimate population size given the relative floor area of the housepits and the number that may have been contemporaneous. The dwellings are large, ranging from about 36 m2 (estimate for Housepits 3 and 6) to about 144 m2 (upper Housepit 1), with an average of about 75 m2 (11 housepits with reasonable estimates of floor area). This size of dwelling could easily have accomodated a large extended family or two related families, perhaps on the order of two or three providing males, an equal number of women providers, and two to four dependent children. This would give us a household of eight to ten individuals. Assuming a minimum of three to four contemporaneous households we can conclude that site occupation comprised 30 to perhaps 50 individuals. This is the commonly estimated size of the minimum band, an organization of related households of sufficient size to ensure group survival (cf., Egan 1969; Helm 1969; Steward 1969). Ray (1932), based on informants' testimony, estimates that three dwellings would house 8-10 families or 40-50 people, at an average of 13-16 people per house. This seems well in line with our estimate derived from general ethnographic studies.

The assumptions used to arrive at these estimates may, of course, be criticized: the space required per person in a dwelling; the interpretation of static activity patterns as reliable indications of prehistoric socioeconomic organization; the segregation of certain tasks by sex; and the assessment of duplicative activity patterns as indicative of task organization, among others. Nonetheless, it seems very likely that at least one occupation during the Kartar Phase involved three to five related households. Our postulation of a minimum band organization should not be startling, since this is argued to be the basic, necessary organizational minimum for group survival (cf., Bicchieri 1965, 1969). What is remarkable is that we have at 45-OK-11 evidence of that population aggregate in the form of a year-round settlement in the period from about 5400-4200 B.P., with diagnostics characteristic of the defined Cascade Phase. This finding calls into question previous culture-historical reconstructions which posit that "winter villages" or semipermanent population aggregates of band-size arose only after 4000 B.P. on the Columbia Plateau in response to technological innovations geared to the enhanced exploitation of previously untapped resources (cf., Nelson 1969, 1973; Leonhardy and Rice 1970; Rice 1974; Ames and Marshall 1981; Ames et al. 1981).

In summary, the Kartar Phase occupation at 45-OK-11 is postulated to have been in the form of a settlement of cooperating households, probably the size of a small band. Site activity may well have been year-round, but it is quite probable that settlement size fluctuated as task groups travelled out to exploit seasonal resources. Dwellings were large, perhaps indicative of households comprising extended families or related families. Cooperation between households seems to be expressed in the extensive butchering areas and the consistent patterning evident in the placement and organization of external activity surfaces and trash disposal areas.

HUDNUT PHASE COMPONENT

After 4000 B.P., the site was used only as a seasonal campsite. This major change is accompanied by marked shifts in diagnostic artifact types and slight changes in the composition of associated floral and faunal assemblages. A wide range of small flake tools partially replace large cobble tools, and the intensity of use in the later component diminishes greatly. However, there is an equally marked similarity in the kinds and uses of tools in both cultural components. No marked change in the range of subsistence activities took place. A proportional shift in the distribution of specific floral and faunal species, from indicators of mesic to xeric local environment, seems likely tied to a gradual change in the local character and location of the river channel.

The features of this component are limited to large scatters of fire-modified rock and general debris, and numerous ill-defined firepits. Housepits, miscellaneous pits, and extensive bone or shell concentrations are lacking. The density of material in these features is quite low compared to those of the Kartar Phase component. Cultural features correlate with high density areas of fire-modified rock, which in turn, roughly correlate with the Kartar Phase housepit depressions. Three radiocarbon dates place occupation between ca. 3900-2800 B.P. Stratigraphic position in the excavated housepit blocks, coupled with this early beginning date, shows that very little time passed between the initial Hudnut Phase occupations and the latest Kartar Phase assemblages, perhaps as little as 150-200 years. The shift in site use and some associated diagnostic artifacts is therefore even more remarkable.

Botanical and faunal assemblages are markedly different from the earlier component. Most plant and animal species taken by site inhabitants during the Hudnut Phase closely approximate those found in the lower Kartar Phase assemblage; what varies is the relative proportion of species present. The botanical assemblage contains far less coniferous wood and a correspondingly greater proportion of hardwoods, and has the notable addition of sagebrush. This may indicate a shift toward a drier local environment. The prevalence of small, xeric-adapted species in the faunal assemblage bears this out. Inhabitants in this later period were taking the same broad range of species, but in far lower numbers. The frequency of river mussel shell also drops off dramatically. This may indicate a shift in the river channel and the composition of the shell beds, a shift in site use, or a lack of emphasis on the mussels if they remained available.

The composition of the tool assemblage suggests that the site economy during this time was basically similar to that observed for the Kartar Phase component. Most tools are simple utilized and retouched flakes, indicative of hunting and butchering activities. A wide variety of formed tools represent the hunting, butchering and processing of game. Pestles and mauls indicate that plants were gathered and processed. The Hudnut Phase assemblage, however, contains far fewer cobble tool forms than the lower Kartar Phase assemblage. It also lacks the variety of cobble tool forms as well as the perplexing overlapping wear patterns of the Kartar Phase specimens. Clearly, cobble tools played a more restricted role in the economy of the Hudnut Phase component. This difference along with the distinctive projectile points, and the lack of a prismatic blade technology, draw the clearest division in artifact assemblages between the two cultural components. The style of tool forms is thus different, although their implied functions are quite similar to those of the Kartar Phase.

Floral and faunal indicators suggest that 45-OK-11 was the scene of spring and early-mid summer activity during the Hudnut Phase. The cultural features--small firepits and ubiquitous scatters of fire-modified rock and light concentrations of artifacts and faunal debris--indicate occupations consisting of small groups. They probably visited the site for short periods in the spring and summer to exploit seasonally available plant and animal resources. Hunting remained a major emphasis. Likewise, river mussels were collected and consumed. Barbed harpoon fragments, and antler and bone points associated with salmonid and cyprinid vertebrae, are evidence of fishing. We cannot gauge the importance of plants in the site economy, except to note that diagnostic tools and economic plant remains are present.

SIGNIFICANCE OF KARTAR AND HUDNUT PHASE CONTRASTS

The shift in site use at about 4200-3800 B.P. does not seem to reflect any significant change in the basic prehistoric adaptive system. Although use of the site proper did change from a permanent settlement to a short-term camp site, about the same range of faunal and floral resources were being taken, and generally comparable tool assemblages were being used in similar tasks that formed the site economy. In both components, deer, mountain sheep, antelope, and a variety of smaller game were exploited; river mussels and fish were common elements of the diet; and pestles and mauls evidence use of plant species. Proportional shift in faunal and floral species, seem to indicate a drier site environment after 3800 B.P., most likely tied to movement of the river channel away from the site and a dropping of the water table. Although this may be a reason for the marked shift in site use, it does not seem to have dramatically affected the resource spectrum available at the site. The Hudnut Phase economy is similar to that of the Kartar Phase in all respects except for the timing, duration, and organization of economic activity at the site. The season of the year is simply more restricted and the size of the population much reduced. The tasks carried out and the species exploited are identical in both cultural components.

Based on the above, and characteristics of the contemporary sites in the project area, we suggest that the change in site use does not represent a substantial change in cultural adaptive strategy. Large housepit settlements during the Hudnut Phase (Miss 1984c; Jaehnig 1984a; Lohse 1984c) reveal socioeconomic organization virtually identical to that described for the Kartar Phase settlement at 45-OK-11. Dwellings were constructed and maintained at year-round settlements and inhabitants exploited a broad range of faunal and floral resources, with an emphasis on hunting of large game species, supplemented by shellfish and plant collection. Three Hudnut Phase settlements (45-OK-258, 45-OK-250, 45-OK-4) are located just upstream from 45-OK-11, within three miles of that site (Figure 1-2). In fact, 45-OK-258 lies less than one mile from the mouth of Hopkins Canyon. Their close proximity and simililar adaptive contexts argue for little change in the attractiveness of this stretch of the Columbia River for overwintering, embodied in the distribution of resources adequate for establishment of permanent settlements. Distinctive artifact distributions change over time, but the basic character of the adaptive system does not.

Viewed within wider context, the shift in site use at 45-OK-11 does not indicate change of any magnitude in the way that people organized themselves to exploit their environment. Rather, different locations were chosen as the site of related activities over time. The shift in the use of site 45-OK-11 may enable us to infer why specific sites were selected for certain kinds of activity. In this instance, the migration of the river channel, and accompanying changes in the water table or the distribution of specific resources (e.g., a possible decline in the richness or accessibility of mussel beds or driftwood accumulation), may have prompted selection of a new settlement site. Repeated use of the site surface for short-term camp sites indicates that 45-OK-11 still attracted human habitation during the Hudnut Phase. However, it was no longer the site of the permanent settlement which housed the winter population aggregate.

IMPLICATIONS FOR PLATEAU PREHISTORY

Throughout the report we have compared assemblages from 45-OK-11 to other Plateau occupations of similar age, focusing on diagnostic artifact categories, technology, and feature types. In this section, we go beyond comparison of specific traits, and consider the broader interpretations developed in the first section of this chapter. We compare the economic base and social organization of the group of people who occupied 45-OK-11 with similar interpretations made for other sites, and with general schema of cultural development presented in the Plateau archaeological literature.

We focus on two issues: regional variation in cultural adaptive strategies prior to 4000 B.P., and the development of semisedentism. We argue, in relationship to both of these topics, that trait lists are of limited utility in comparing sites and interpreting adaptive strategies and that theoretical postulates about cultural adaptation must be developed before we can adequately explain cultural change on the Columbia Plateau.

REGIONAL VARIATION IN ADAPTIVE SYSTEMS PRIOR TO 4000 B.P.

Site 45-OK-11 contains evidence that a centrally-based, generalized hunting and gathering economy existed in the area from about 5400 B.P. to 4200 B.P. The presence of Cascade and Cold Springs Side-notched projectile points, a prismatic blade technology, an intensive cobble tool industry, and a well-developed bone tool industry correlate our Kartar Phase assemblage with the Cascade Phase defined for the lower Snake River regions. We have documented a year-round settlement that is of microband size at least seasonally (perhaps during the winter months only). This settlement had housepits, and presents evidence of an economic emphasis on the hunting of large ungulates (deer, elk, mountain sheep, antelope) and the gathering of shellfish. We do not know when this pattern was established, but we can infer that it was in existence before 5000 B.P.

Evidence of semisedentary settlement at this early date challenges previous cultural reconstructions outlining the nature of human adaptive systems on the Columbia Plateau prior to 5000-4000 B.P. We can no longer assume that all assemblages with diagnostic Cascade phase traits indicate a society of nomadic, dispersed family bands of hunters and gatherers who wandered throughout the year, exploiting a very broad territory. This sort of adaptive pattern has been postulated for the Lower Snake River region between 5000 and 4000 B.P. (Nelson 1969; Leonhardy and Rice 1970; Bense 1972).

The Kartar Phase settlement at 45-OK-11 probably was made up of a number of cooperating households which shared a defined exploitative territory encompassing the river, its banks, uplands and plateaus. From this location, the band could maintain itself over much, if not all, of the year. Thus, the material traits shared with Lower Snake sites do not necessarily represent similar adaptive strategies. Rather, prehistoric economic strategy was predicated on particular resource arrays in specific environments; and adaptive strategies varied according to the resources available.

DEVELOPMENT OF SEMISEDENTISM

We interpret the Kartar Phase settlement pattern, of which the 45-OK-11 occupation is a part, as semisedentary rather than sedentary. Even though floral and faunal evidence points to activity in all seasons at 45-OK-11, the site probably was not the year-round locus of the population. It is likely that the largest number of households dwelled there only during the winter months and that the settlement was maintained throughout the rest of the year by a small resident population or by seasonal task groups that used the site as a central base. After winter passed, households or task groups may have dispersed to exploit seasonally recurrent resources. The winter site thus served as the year-round focus for the band even while its members were dispersed much of the year to hunt and gather seasonal foods.

The development of semisedentism has long been a topic of interest to Plateau archaeologists. Housepit settlements have commonly been equated with a semisedentary settlement pattern, as in the "ethnographic pattern" (Swanson 1962), the "Plateau pattern" (Warren 1968), or the "winter village pattern" (Nelson 1969, 1973). Housepits were assumed to be a recent phenomenon on the Plateau, no more more than 3,000 years old. However, recent reports by Donahue (1975), Brauner (1976), Helmer (1977), and Ames, et al. (1981) describe housepits dating from ca. 5000-4000 B.P. Earlier researchers (cf. Daugherty 1962, 1973; Swanson 1962; Browman and Munsell 1969; Nelson 1969, 1973; Leonhardy and Rice 1970; Rice 1974) had speculated that this adaptive pattern had its origins in the development of an efficient fishing technology that made full use of the salmon runs on the Columbia River and its tributaries. Researchers have also postulated that the development of semisedentary settlement was the result of intensive exploitation of kouse and camas root crops, perhaps coupled with an emphasis on utilization of the rich salmon resource (cf. Browman and Munsell 1969; Leonhardy and Rice 1970; Rice 1974; Ames et al. 1981; Ames and Marshall 1981).

More recently, Schalk et al. (1983) have cautioned researchers that evidence to date does not show intensive economic specialization during any period of Plateau prehistory. In addition, they argue that there is no reason to suppose that exploitation of any particular resource, no matter how productive, led to the development of semisedentary settlements. Schalk, et al. (1983:31-32) argue:

> The emergence of semisedentism in the Plateau is marked by a number of approximately contemporaneous and seemingly correlated changes in the organization of subsistence and settlement. Associated with the increased degree of sedentism, there appears to be a general shift from winter hunting to food storage as the primary over-wintering strategy. A consequence of this shift is that storeable resources, in this case fish and plants, contribute a significantly greater proportion of the total diet; winter hunting assumes a supplementary role in subsistence. Locations of

> winter settlement become the focal points in a settlement system that is much more centralized and hierarchical due to a general shift from residential mobility to logistic mobility as the primary means for linking consumers with food resources (Binford 1980). In other words, resource exploitation involves a greater degree of resource transport by specialized task groups rather than actual movements of an entire local group to the procurement sites.

To Schalk and others, the first appearance of semisedentism represents a quantum change in the organization of settlement and subsistence. They argue that food storage prompted the transition to semisedentary land use, and that this was the first major recognizable evolutionary change in adaptation on the Plateau.

We hold a more conservative position: semisedentary settlement evolved on the Plateau as a response to a number of factors, varying in relative importance from region to region. Food storage, though an important element of the adaptive system, was not necessarily more important than the winter hunting of ungulates. Semisedentary settlements did not necessarily result from technological innovations or discoveries of new and immensely productive resources. Rather, small changes in the logistical organization of the adaptive system were sufficient to allow semisedentary settlement.

While storage is one means by which hunter-gatherers ensure a regular food supply, the same effect can be achieved by placing settlements to take advantage of predictable resource distributions. The movement of human adaptive units to selected spots on the landscape, the 'positioning strategy' of Binford (1980) is a functional correlate of, and a precondition of, efforts to store food. In at least some areas of the Columbia Plateau, during some time periods, a positioning strategy was an effective strategy for overwintering. By placing winter settlements in optimal locations that commanded access to a variety of recurring seasonal and permanent resources, a stable resource base was achieved, even during the critical winter months.

On the Columbia Plateau, one optimum situation for settlements was along the river floodplain, in locations protected from weather, with sunny exposure during the winter months, and with access to ungulate populations, shellfish beds, and non-anadromous fish. Storage, with or without specialized techniques, was probably used to husband root and plant crops harvested in the spring, fish taken in summer and fall, and the necessary materials for manufacture and maintenance of tools and clothing over the winter months. These resources were necessary only to the degree that they supplemented or were supplemented by seasonally available resources like game and shellfish. No resource was of preeminent importance. At other locations on the Columbia Plateau, resource configurations may have prompted greater or lesser reliance on any single resource or resource set.

We view both permanency of settlement and food storage on a continuum ranging from high mobility without food storage to permanent settlements with an absolute dependence on storage. In Binford's (1980) terms, an analytic framework may be conceptualized wherein human adaptive systems vary along a range from those that are highly mobile in order to ensure resource fit to those that rely on the intensification of logistical organization to develop tight controls over restricted resource distributions. Hunters thus fall at one end of the continuum, farmers at the other. Using such a continuum as a reference, site 45-OK-11 represents a semisedentary settlement whose inhabitants manipulated an array of resources, perhaps with a special emphasis on one or more productive, or predictable, resources. A little further along the continuum would be semisedentary settlements with a marked dependence on stored food for survival in times of stress, i.e., the ethnographic "winter village pattern." We do not see a quantum change in the organization of settlement and subsistence between these two adaptive strategies, nor do we believe this signals a major evolutionary change, as do Schalk, et al. (1983).

We would argue that increased emphasis on storage, expressed in the development of formal storage structures, signals an adaptive system under stress. Such stress may be caused by the system outstripping its resource base through increasing population density and/or by resource fluctuation due to environmental factors. Storage structures may indicate that space for expansion is limited and that resources are being strained. Indeed, establishment of large, permanent settlements, whose size and locations are made possible by increased food storage, shows that the adaptive system is maintaining larger numbers of people on a finite set of resources. As technology and social organization change to support an increasing population with less movement, the adaptive system becomes more specialized and thus has an increased potential for wide oscillation of system parameters in response to stress.

INTERPRETIVE APPROACHES

Interpretive archaeological work on the prehistory of the Columbia Plateau is characterized by a heavy reliance on trait lists. Traits constitute the ordering of phenomena, and as such provide the foundation on which archaeologists can build explanations. It must, however, be kept in mind that they are purely descriptive categories, and no amount of careful or insightful correlation can elevate traits to the role of explanation. Archaeologists cannot indiscriminately seize upon diagnostic cultural traits to explain cultural change. We must, instead, recognize different kinds of cultural traits, and interpret these only within their defined context. Traits with discrete temporal distributions should be used to establish the chronological scale. Traits presumed to mark functional differences in artifact use patterns should be used to define temporal-spatial differences in prehistoric economies. Still other traits must be defined that reflect the socioeconomic organization of prehistoric human groups. The analysis of trait distributions acquires meaning only when related to explicit postulates describing the behavior of human adaptive systems.

We cannot explain the development of semisedentary living on the Columbia Plateau by defining correlations of undifferentiated traits over time. At worst, this leads us to link observed traits to perceived environmental changes, and hold this correlation somehow accountable for cultural changes. At best, we consider traits indicative of increasing levels of social or adaptive control. Neither approach is satisfactory. They do not result in explanations of the interrelationship of cultural systems and their environments and, thus, cannot consistently relate variable patterns in the archaeological record. To do this we must develop an interpretive model based on known human behavior at a broad conceptual level. We can then place individual adaptive patterns into a larger regional perspective that allows us to explore questions of variability and cultural change in this regional context.

In describing band-level hunter-gatherer adaptive systems, variables to be considered include: (1) the size of the population, (2) the resource nexus available to them, and (3) and other more specific environmental and cultural vectors that channel and direct the specific form the system takes. Measurement of these variables will be relative, conveyed as a range between two unreachable end points.

A basic assumption concerning population size is that human groups do not exist in population aggregate sizes smaller than that necessary for biocultural viability. This aggregate is commonly called the microband or minimum band (Bichieri 1969, Eggan 1969, Helm 1969). This does not imply that related families are joined throughout the year or even in a given season, only that they have the opportunity for close interaction. Households may be the basic units of production (Sahlins 1972), but the larger grouping--the band--ensures survival. This system of interaction defines, and is bounded by, its territory, an area exploited by related families and held by the band. In this sense, the band assumes a reality separate from its constituent families; its membership characteristically flexible and its territorial boundaries permeable.

The resource nexus (Silverbauer 1981) is the combination of resources necessary to ensure the survival of the band. Band level hunting and gathering societies do not manipulate the productivity of their environments so much as they are dependent on the availability of plant, animal, and other resources. Their settlements, therefore, are limited to areas where resources occur in sufficient quantity and quality to ensure group survival. Physical parameters define a range of potential locations for human activity and limit the size of the population aggregate (cf. Bicchieri 1969, proposed band-level classification). The natural environment is seen to range from restricted to permissive. Flexibility in the the human adaptive system is directly related to the latitude permitted by the resource distribution.

Research questions related to this variable have to do with the reason for site selection, and the range and relative importance of exploited resources documented in the archaeological record. General climatic and edaphic factors as reflected in major vegetation communities and local plant associations influence the necessary elements of the resource nexus. On the Columbia Plateau, and its regional and local subdivisions, these elements differ markedly.

The identification of vectors creates the multidimensional space essential for the description of behavior of human adaptive systems. Variation in the magnitude and direction of the force applied influences the magnitude and direction of cultural change. Analysis can measure the magnitude and direction of vectors and of cultural change. We describe probable reactions of the adaptive system by isolating and measuring the vectors that form the interrelationship between human society and its physical or cultural environment. One measure of the cultural system is the degree of population aggregation, measured as the population density/carrying capacity. Another is increasing permanency in settlement occupation. Vectors include elements defined for the resource nexus: need for water, dependence on wood for fuel and dwelling construction, use and maintenance of sufficient resources to ensure survival, and adequate space for adjustment of population density/carrying capacity. These vectors and related variables of logistical organization and technology influence the form of the adaptive system.

We assume that systems are basically conservative. When one or more vectors are strong enough to cause significant adjustments in the system, human societies will first attempt to adjust population density or carrying capacity by movement, resulting in either movement of the entire group or splitting of the original population into smaller groups. This simple, direct adjustment requires a low regional population density and open space for expansion or the formation of new band territories. If the population density of a region is already high, making territorial expansion difficult or impossible without open competition and conflict, we postulate that changes of increasing magnitude will be made in logistical organization, perhaps concurrent with innovations in technology.

Changes in the adaptive system are not linear. However, thresholds of population density or resource specialization are reached from which adaptive systems, by virtue of their conservatism, will find it difficult to return to the simpler, more generalized system state. Once across a threshold, systems will manipulate selected variables rather than suffer a major disruption. This can be seen in the archaeological record of the Columbia Plateau where researchers have recognized a general trend toward increasing population density coupled with increasing dependence on certain productive resources, and increasing storage of food.

Only by using a general interpretive model like the one above can we explain the probable processes of adaptation. It is not enough to discover the earliest occurrence of a trait such as a housepit. We must assign housepits a value established in terms of the behavioral postulates outlined above. In this sense, permanent settlement with a number of contemporaneous large housepits, intensified food storage, and resource specialization, are traits that define a point on human society's adaptive continuum. They are evidence of increasing sedentism based on higher population density linked with enhanced productivity and food storage.

CONCLUSIONS

The size and permanency of the 45-OK-11 settlement points to a band organization, perhaps on the order of Bicchieri's (1969) cohesive band, where households are consistently united at the level of the minimum band and exhibit little variation in size. Since this organization exists by 5000 to 4000 B.P., there is every reason to suspect it occurred at yet an earlier time on the Columbia Plateau. From our perspective, then, the transition from highly mobile bands of hunters and gatherers took place prior to the late Kartar Phase, at least in our project area. We need not postulate a change in the basic social organization or economic strategy. Resource manipulation/conservation led to more intense exploitation of sets of resources selected because they possessed some measure of relative productivity and so enhanced processes already guiding a semisedentary life style. This assumes, then, that a basic, generalized, centrally-based adaptive system, with or without housepits, existed on the Plateau throughout the known span of human occupation.

According to the framework presented here, 45-OK-11, an example of a semisedentary, band-sized settlement, represents on point on the continuum of increasingly sedentary settlement. As we have no evidence of specialized exploitation of root crops or fish, nor of a heavy dependence on storage, it is a precursor of the winter village pattern described ethnographically. Positioning, careful scheduling, and perhaps some storage provided the level of security necessary for group survival. Year-round use of the site indicates a comfortable fit between carrying capacity, population density, and territory size. A river-focused resource nexus supported semi-permanent settlement. Permanent and seasonal resources were available sufficiently close to the river to facilitate easy access by small groups during the appropriate seasons, or by larger groups, if cooperation was needed.

The evidence from 45-OK-11 suggests a new approach to explaining the development of semisedentary settlement on the Columbia Plateau. Researchers have tried to identify the single variable that gave rise to the "winter village pattern." As evidence of this single variable, they most often cite a basic change in economic strategy or a technological innovation: new emphasis on fishing, or intensive exploitation of root crops, or the development of adequate storage techniques. These inferences are not wrong for any given historical sequence of events in any specific area. However, because they do not focus on the entire adaptive system, they prove inadequate as a means of interpreting Columbia Plateau prehistory. Further, we have no reasonable way of measuring their significance in the archaeological record. All too often, these interpretations are based on the primacy of a given resource and the representativeness of a single, unqualified sample from one site or a limited number of sites. We argue that it is more valuable to recognize the basic logistical nature of the general human adaptive system, and to assess the relationship between individual site economies and specific environments.

We have argued that the manipulation of cultural traits to detect cultural change results in inferences of limited significance. We must instead enlarge the scope of our analyses, and think in terms of adaptive systems, and the three sets of variables which we have defined. If we do so, we can guide future research to the collection and analysis of data that can increase our understanding of processes of adaptation to the varied environments of the Columbia Plateau.

More work is needed to place the Kartar Phase settlement at 45-OK-11 in regional perspective. At this time, we can conclude that existing cultural reconstructions on the Plateau do not adequately explain this early semipermanent settlement. We hope that the hypotheses and conclusions we have advanced will stimulate renewed discussion on the evolution of the winter village pattern on the Columbia Plateau.

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APPENDIX A:

RADIOCARBON DATE SAMPLES

Table A-1. Radiocarbon date samples, 45-OK-11.

Lab Sample #[1]	Zone	DU	Stratum	Unit	Level	Feature #	Material/gms	Radiocarbon Age (years B.P.) T1/2=5730	Dendrocorrected Age[2] (years B.P.)
TX-2699	11	-	-	54N72E	50A	-	Charcoal/2.8	3337±520	3557±523
	Flotation samples from level 50 close to radiocarbon sample contain: bitterbrush (*Purshia tridentata*), yellow pine, Douglas fir (*Pseudotsuga menziesii*), juniper (*Juniperus scopulorum*) and larch (*Larix*). No disturbance.								
TX-3059	62	V	125	24N67E	80	-	Charcoal/2.2	3584+410	3872+412
TX-3379	65	IV	155	75N70E	165	18	Charcoal/7.4	4200±80	4808±130
	Feature consists of C-14 sample only. Taken from immediately below floor of Upper Housepit 1, in fill of Lower Housepit 1.								
TX-3380	61	IV	152	80N66E	160	7	Charcoal/4.5	4130±110	4719±150
	Firepit, Upper Housepit 1.								
TX-3381	44	IV	152	35N61E	160	201	Charcoal/7.4	3730±130	4200±180
	In Housepit 4 wall, near rim. May provide limit for Housepit 4.								
TX-3382	12	-	-	38N58E	140	44	Charcoal/6.2	3720±160	4187±206
	Shell concentration in upper fill, Housepit 5								
TX-3383	82	-	-	127N78E	100	-	Charcoal/8.0	4240±65	4858±145
TX-3384	12	-	-	8N75E	300	-	Charcoal/9	4680±330	5401±343
B-4284	12	-	-	13N63E	170	12	Charcoal/5	4250±60	4872±142
	Housepit 2 floor.								
B-4285	11	-	-	37N69E	50	13	Charcoal/2.7	2650±120	2800±130
	Firepit in Area 1, Zone 1.								
B-4286	-	-	-	22N68E	210	48	Charcoal/3.7		
	Insufficient carbon for measurement.								
B-4287	12	-	-	58N58E	120	17	Charcoal/5	4440±100	5108±154
	Housepit 3 floor.								
B-4288	12	-	-	42N67E	200	403	Charcoal/3.1	4160±120	4757±157
	Housepit 8, lower floor.								

Table A-1. Cont'd.

Lab Sample #[1]	Zone	DU	Stratum	Unit	Level	Feature #	Material/gms	Radiocarbon Age (years B.P.) T1/2=5730	Dendrocorrected Age[2] (years B.P.)
B-4289	12	-	-	0S62E	220	51	Charcoal/5	4100±130	4680±165
	Occupation surface partially exposed, Area 1, Zone 1.								
B-4290	63	IV	154	72N61E	160	75	Charcoal/20	3910±70	4434±117
	Housepit 11 floor.								
B-4291	65	IV	155	79N71E	155	101	Charcoal/3.7	4390±220	5047±249
	Lower Housepit 1 floor.								
B-4292	35	IV	155a	19N59E	160	-	Charcoal/5	4490±120	5171±151
	Apparently dates Feature 121, an enigmatic feature in Area 3, Zone 5. Feature 121 may be a housepit wall or, more likely, a sloping pile of midden or backdirt; inversion with date from Feature 141 (B-4293).								
B-4293	36	III	170	17N59E 17N59E	200 190	141	Charcoal/3.3	3890±100	4409±13
	Two samples combined. Occupation surface in Area 3, Zone 6. Feature definitely older than Feature 121, although dates appear to be inverted.								
B-4294	24	IV	155	18N63E	190	UL and 155	Charcoal/3.7	4170±110	4770±150
	Occupation Surface A. Well-documented surface in Area 2.								
B-4295	46	III	160	35N65E	175	185	Charcoal/5	4420±120	5085±166
	Occupation surface below Housepit 4; truncated by housepit.								
B-4296	45	IV	155	35N64E	180	181	Charcoal/5	4010±110	4564±150
	Housepit 4 floor.								
B-4822	72	-	-	114N74E 113N74E 113N75E 114N74E 113N74E	70 70 70 60 60	-	Mammal bones	3850±85	4486±134
	Five samples were combined. Date from large bone concentration in which Features 3, 8, 9 were recorded.								

[1] TX samples were dated by University of Texas-Austin, Radiocarbon Laboratory.
B samples were dated by Beta Analytic, Inc.

[2] Dendrocorrected after Damon et al. (1974).

APPENDIX B:

ARTIFACT ASSEMBLAGE, 45-OK-11

Table B-1. Individual projectile point data, 45-OK-11.

Master Number	Historic Type	Morphological Type	Complete Morphological Class	Zone	Feature	Association
424	41	3	1NM5221NM3	44	200	Housepit 4 fill
1795	41	3	1NM2221NM1	65	6	Lower HP1 wall
2752	52	7	21212829NM1	11	–	–
2048	52	7	21219122NM4	11	–	–
2714	52	7	21211231NM1	11	–	–
2120	51	7	21212221NM3	12	–	–
2625	51	7	21212121NM1	24	38	Shell midden
622	51	7	21212211NM1	41	–	–
916	51	7	21211121NM1	41	–	–
897	51	7	21215211NM1	52	100	Upper HP1 fill
1612	51	7	21212912NM1	52	–	–
1158	53	7	21214121NM3	53	100	Upper HP1 fill
1748	51	7	21214121NM3	65	6	Lower HP1 wall
1845	51	7	21212211NM1	65	–	–
2169	51	7	21211829NM1	72	3	Bone concentration
2298	51	7	21212211NM1	81	–	–
2354	52	8	21222221NM1	11	–	–
2016	52	8	21221242NM1	11	–	–
2840	51	8	21222141NM1	11	–	–
2760	53	8	21224122NM1	11	–	–
2557	51	8	21222211NM1	22	–	–
935	51	8	21221331NM1	41	–	–
914	51	8	21222132NM3	52	–	–
1591	52	8	21221221NM1	52	–	–
943	52	8	21222222NM1	52	–	–
1308	53	8	21224122NM3	52	–	–
1195	53	8	21224142NM1	53	100	Upper HP1 fill
1583	52	8	21221221NM1	53	100	Upper HP1 fill
2333	51	8	21224122NM1	71	–	–
2210	52	8	21222321NM1	71	–	–
2067	51	8	21221122NM1	71	–	–
2197	53	8	21222121NM1	71	–	–
2306	51	8	21221221NM1	81	–	–
2004	61	10	21329211NM1	11	–	–
2692	31	6	22NM2221121	11	–	–
2321	31	5	22NM2241121	12	–	–
2042	31	6	22NM2229121	12	–	–
2392	23	6	22NM3242191	12	–	–
2348	31	6	22NM1241123	12	–	–
2398	21	6	22NM2221131	12	–	–
2029	31	6	22NM5241133	12	500	Housepit 7 fill
2816	31	6	22NM1221121	12	41	Shell concentration
2347	31	6	22NM2241133	12	–	–
2575	31	6	22NM1221123	22	–	–
2616	31	6	22NM1121124	23	–	–
334	31	6	22NM2221121	24	154	Occupation surface
364	21	6	22NM1221121	24	–	–
2609	31	6	22NM2241121	25	–	–
2540	31	6	22NM1221121	32	–	–
600	31	6	22NM2221223	33	–	–
2542	31	6	22NM2241121	33	–	–
510	31	6	22NM1211121	34	–	–
2237	21	6	22NM4241121	43	–	–
668	31	6	22NM2131121	43	–	–
1019	15	6	22NM3221121	46	185	Occupation surface
1888	31	6	22NM2828129	52	–	–
899	31	6	22NM1221123	53	100	Upper HP1 fill
965	31	6	22NM1221123	53	100	Upper HP1 fill
1816	31	6	22NM1221133	54	90	Housepit 12 fill
1900	31	6	22NM2928129	54	148	Upper HP1 wall
1903	31	6	22NM1829121	54	149	Upper HP1 wall

Table B-1. Cont'd.

Master Number	Historic Type	Morphological Type	Complete Morphological Class	Zone	Feature	Association
830	31	6	22NN1211123	55	–	–
1908	21	6	22NN2221121	56	–	–
1248	31	6	22NN3221121	56	–	–
1777	31	6	22NN1221123	61	–	–
889	31	6	22NN9221191	64	–	–
1145	31	6	22NN1221121	65	101	Lower HP1 floor
1570	31	6	22NN1231123	65	101	Lower HP1 floor
1085	31	6	22NN1229129	65	–	–
2707	31	6	22NN2221121	72	–	–
2702	31	6	22NN1241121	72	–	–
2096	31	6	22NN4221121	72	–	–
2710	31	6	22NN9241191	72	–	–
2141	31	6	22NN1241121	72	–	–
231	31	6	22NN2929139	81	–	–
253	21	6	22NN2221124	81	–	–
2686	62	13	31112821NN1	11	–	–
1104	61	13	31119121NN1	61	–	–
2143	61	13	31112329NN1	71	–	–
2229	63	14	31122141NN1	41	–	–
2050	51	11	31212849NN1	11	–	–
1741	61	11	31211211NN3	53	100	Upper HP1 fill
2655	52	12	31223111NN1	11	–	–
2603	63	12	31228222NN1	22	–	–
2579	53	12	31229222NN1	23	–	–
1307	64	12	31221141NN1	51	–	–
1486	61	13	31312829NN9	62	104	Lower HP1 fill
2000	64	17	41112221NN3	12	403	Lower HP6 floor
1556	64	18	41125321NN1	52	–	–
1301	81	1	N1N19211NN1	51	–	–
2727	51	2	N1N23121NN1	11	–	–
1980	21	5	N2NN4221121	11	–	–
2586	21	5	N2NN1221121	11	–	–
2314	23	5	N2NN4212121	11	–	–
2124	21	5	N2NN2241123	11	–	–
2383	21	5	N2NN2211123	12	–	–
2396	31	5	N2NN2221191	12	–	–
2677	23	5	N2NN4241122	12	–	–
2595	21	5	N2NN4221123	12	–	–
2622	23	5	N2NN2221121	22	–	–
291	22	5	N2NN5211131	24	–	–
357	21	5	N2NN2221133	24	154	Occupation surface
592	21	5	N2NN9221121	33	–	–
2528	23	5	N2NN1241123	33	–	–
2260	21	5	N2NN1221123	43	–	–
931	31	5	N2NN9221193	43	–	–
454	21	5	N2NN2221123	43	–	–
525	21	5	N2NN2221121	43	–	–
922	21	5	N2NN1241123	43	–	–
2248	21	5	N2NN1241121	43	–	–
456	23	5	N2NN2232123	44	200	Housepit 4 fill
886	23	5	N2NN2241121	52	–	–
1620	21	5	N2NN2211135	53	100	Upper HP1 fill
1577	21	5	N2NN4221124	53	100	Upper HP1 fill
1666	21	5	N2NN2221121	53	55	Occupation surface
974	21	5	N2NN2241123	53	100	Upper HP1 fill
756	21	5	N2NN1221123	54	–	–
752	21	5	N2NN2241123	54	–	–
1497	23	5	N2NN2231124	61	100	Upper HP1 fill
1109	21	5	N2NN2211124	61	100	Upper HP1 fill
1775	21	5	N2NN2221123	61	–	–
1164	21	5	N2NN4211923	61	31	Upper HP1 floor
1516	21	5	N2NN9221191	62	104	Lower HP1 fill

Table B-1. Cont'd.

Master Number	Historic Type	Morphological Type	Complete Morphological Class	Zone	Feature	Association
1044	21	5	N2NN1241133	62	104	Lower HP1 fill
2708	21	5	N2NN3241121	71	–	–
2091	21	5	N2NN4221123	71	–	–
2159	31	5	N2NN2221123	72	–	–
2070	21	5	N2NN2241123	72	–	–
2299	23	5	N2NN2132111	81	–	–
238	21	5	N2NN2221123	82	–	–
Fragments						
76	–	8	21222112NN1	11	–	–
2716	–	8	21222121NN1	11	–	–
2762	–	8	21221341NN1	11	–	–
2723	–	–	31929322NN3	11	–	–
2767	–	–	31919122NN2	11	–	–
962	–	–	31929222NN1	51	–	–
1681	–	–	41929221NN1	52	–	–
898	–	–	92NN1929129	52	100	Upper HP1 fill
1781	–	–	92NN1929323	52	100	Upper HP1 fill
1192	–	8	21224141NN1	53	28	F53 chipping scatter
900	–	–	92NN2929121	53	100	Upper HP1 fill
956	–	–	92NN1929121	53	100	Upper HP1 fill
1348	–	–	92NN1929123	53	100	Upper HP1 fill
1788	–	5	N2NN1221122	53	100	Upper HP1 fill
1949	–	6	22NN1211122	12	250	Housepit 3 fill
2411	–	–	92NN1929311	12	–	–
2541	–	6	22NN1919121	24	–	–
2481	–	–	92NN1929124	33	–	–
2508	–	6	22NN3929129	33	–	–
1937	–	6	22NN5929129	35	–	–
453	–	5	N2NN2229123	43	–	–
892	–	–	92NN1929121	43	–	–
773	–	6	22NN9221991	54	5	Upper HP1 wall
1122	–	–	92NN1929121	61	100	Upper HP1 floor/wall
1472	–	–	92NN2949121	61	100	Upper HP1 floor/wall
1053	–	–	92NN1929121	61	31/100	Upper HP1 floor/fill
1459	–	5	N2NN1229121	61	31	Upper HP1 floor
1334	–	–	92NN9221993	61	31	Upper HP1 floor
1435	–	–	92NN9211993	61	31	Upper HP1 floor
651	–	–	31919121NN3	64	75	Housepit 11 floor
2225	–	–	92NN9929329	82	–	–
2283	–	5	N2NN2131123	82	–	–

Table B-1. Cont'd.

Master Number	Historic Type	Morphological Type	Complete Morphological Class	Zone	Feature	Association
830	31	6	22NN1211123	55	–	–
1908	21	6	22NN2221121	56	–	–
1248	31	6	22NN3221121	56	–	–
1777	31	6	22NN1221123	61	–	–
889	31	6	22NN9221191	64	–	–
1145	31	6	22NN1221121	65	101	Lower HP1 floor
1570	31	6	22NN1231123	65	101	Lower HP1 floor
1085	31	6	22NN1229129	65	–	–
2707	31	6	22NN2221121	72	–	–
2702	31	6	22NN1241121	72	–	–
2096	31	6	22NN4221121	72	–	–
2710	31	6	22NN9241191	72	–	–
2141	31	6	22NN1241121	72	–	–
231	31	6	22NN2929139	81	–	–
253	21	6	22NN2221124	81	–	–
2686	62	13	31112921NN1	11	–	–
1104	61	13	31119121NN1	61	–	–
2143	61	13	31112329NN1	71	–	–
2229	63	14	31122141NN1	41	–	–
2050	51	11	31212949NN1	11	–	–
1741	61	11	31211211NN3	53	100	Upper HP1 fill
2655	52	12	31223111NN1	11	–	–
2603	63	12	31229222NN1	22	–	–
2579	53	12	31229222NN1	23	–	–
1307	64	12	31221141NN1	51	–	–
1486	61	13	31312929NN9	62	104	Lower HP1 fill
2000	64	17	41112221NN3	12	403	Lower HP6 floor
1556	64	18	41125321NN1	52	–	–
1301	81	1	N1N19211NN1	51	–	–
2727	51	2	N1N23121NN1	11	–	–
1980	21	5	N2NN4221121	11	–	–
2586	21	5	N2NN1221121	11	–	–
2314	23	5	N2NN4212121	11	–	–
2124	21	5	N2NN2241123	11	–	–
2393	21	5	N2NN2211123	12	–	–
2396	31	5	N2NN2221191	12	–	–
2677	23	5	N2NN4241122	12	–	–
2595	21	5	N2NN4221123	12	–	–
2622	23	5	N2NN2221121	22	–	–
291	22	5	N2NN5211131	24	–	–
357	21	5	N2NN2221133	24	154	Occupation surface
592	21	5	N2NN9221121	33	–	–
2528	23	5	N2NN1241123	33	–	–
2260	21	5	N2NN1221123	43	–	–
931	31	5	N2NN9221193	43	–	–
454	21	5	N2NN2221123	43	–	–
525	21	5	N2NN2221121	43	–	–
922	21	5	N2NN1241123	43	–	–
2248	21	5	N2NN1241121	43	–	–
456	23	5	N2NN2232123	44	200	Housepit 4 fill
886	23	5	N2NN2241121	52	–	–
1620	21	5	N2NN2211135	53	100	Upper HP1 fill
1577	21	5	N2NN4221124	53	100	Upper HP1 fill
1686	21	5	N2NN2221121	53	55	Occupation surface
974	21	5	N2NN2241123	53	100	Upper HP1 fill
756	21	5	N2NN1221123	54	–	–
752	21	5	N2NN2241123	54	–	–
1487	23	5	N2NN2231124	61	100	Upper HP1 fill
1109	21	5	N2NN2211124	61	100	Upper HP1 fill
1775	21	5	N2NN2221123	61	–	–
1164	21	5	N2NN4211923	61	31	Upper HP1 floor
1516	21	5	N2NN9221191	62	104	Lower HP1 fill

Table B-1. Cont'd.

Master Number	Historic Type	Morphological Type	Complete Morphological Class	Zone	Feature	Association
1044	21	5	N2NN1241133	62	104	Lower HP1 fill
2708	21	5	N2NN3241121	71	–	–
2091	21	5	N2NN4221123	71	–	–
2159	31	5	N2NN2221123	72	–	–
2070	21	5	N2NN2241123	72	–	–
2299	23	5	N2NN2132111	81	–	–
238	21	5	N2NN2221123	82	–	–
Fragments						
76	–	8	21222112NN1	11	–	–
2716	–	8	21222121NN1	11	–	–
2762	–	8	21221341NN1	11	–	–
2723	–	–	31929322NN3	11	–	–
2767	–	–	31919122NN2	11	–	–
962	–	–	31929222NN1	51	–	–
1681	–	–	41929221NN1	52	–	–
898	–	–	92NN1929129	52	100	Upper HP1 fill
1781	–	–	92NN1929323	52	100	Upper HP1 fill
1192	–	8	21224141NN1	53	28	F53 chipping scatter
900	–	–	92NN2929121	53	100	Upper HP1 fill
956	–	–	92NN1929121	53	100	Upper HP1 fill
1348	–	–	92NN1929123	53	100	Upper HP1 fill
1788	–	5	N2NN1221122	53	100	Upper HP1 fill
1949	–	6	22NN1211122	12	250	Housepit 3 fill
2411	–	–	92NN1929311	12	–	–
2541	–	6	22NN1919121	24	–	–
2481	–	–	92NN1929124	33	–	–
2508	–	6	22NN3929129	33	–	–
1937	–	6	22NN5929129	35	–	–
453	–	5	N2NN2229123	43	–	–
892	–	–	92NN1929121	43	–	–
773	–	6	22NN9221991	54	5	Upper HP1 wall
1122	–	–	92NN1929121	61	100	Upper HP1 floor/wall
1472	–	–	92NN2949121	61	100	Upper HP1 floor/wall
1053	–	–	92NN1929121	61	31/100	Upper HP1 floor/fill
1459	–	5	N2NN1229121	61	31	Upper HP1 floor
1334	–	–	92NN9221993	61	31	Upper HP1 floor
1435	–	–	92NN9211993	61	31	Upper HP1 floor
651	–	–	31919121NN3	64	75	Housepit 11 floor
2225	–	–	92NN9929329	82	–	–
2283	–	5	N2NN2131123	82	–	–

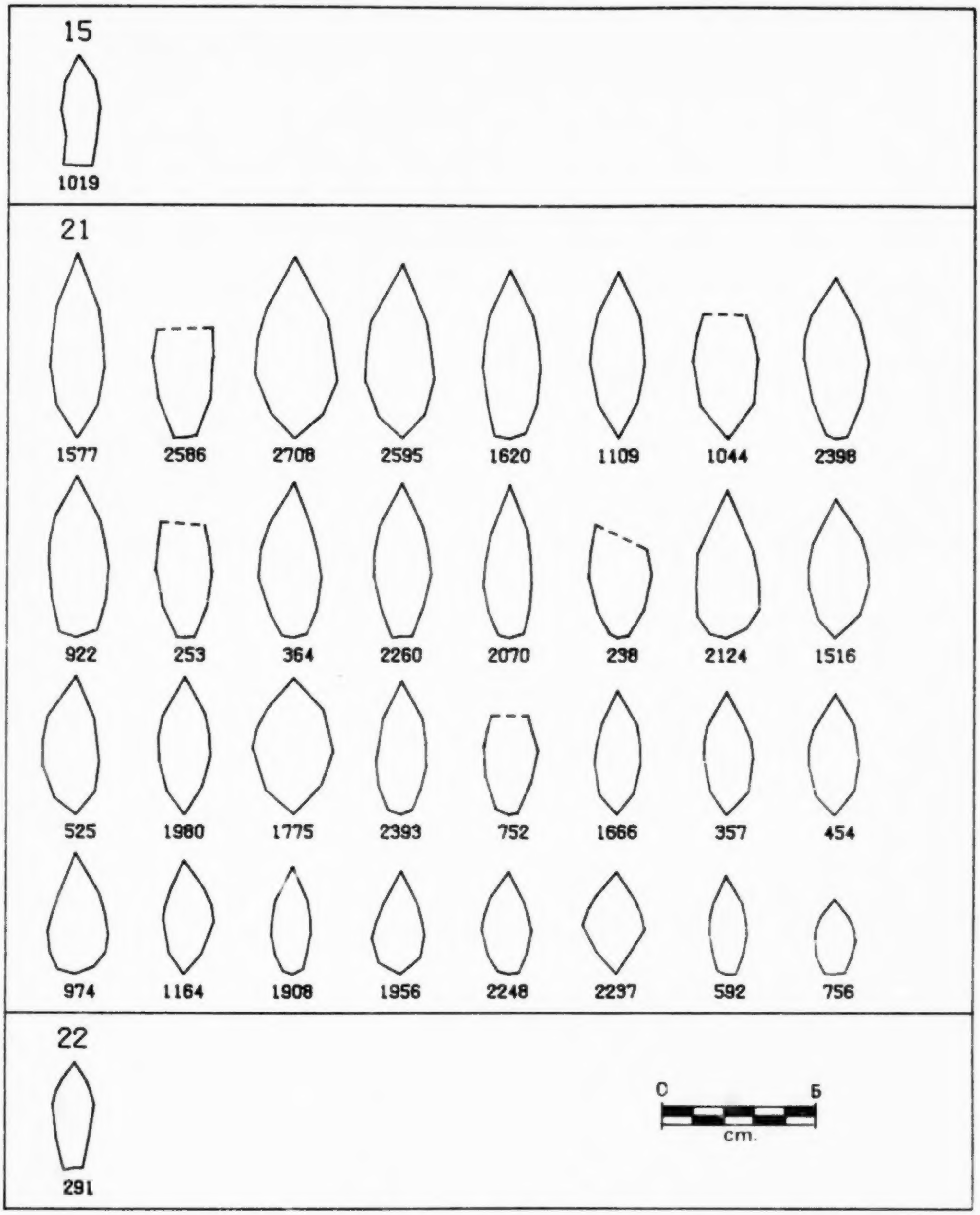
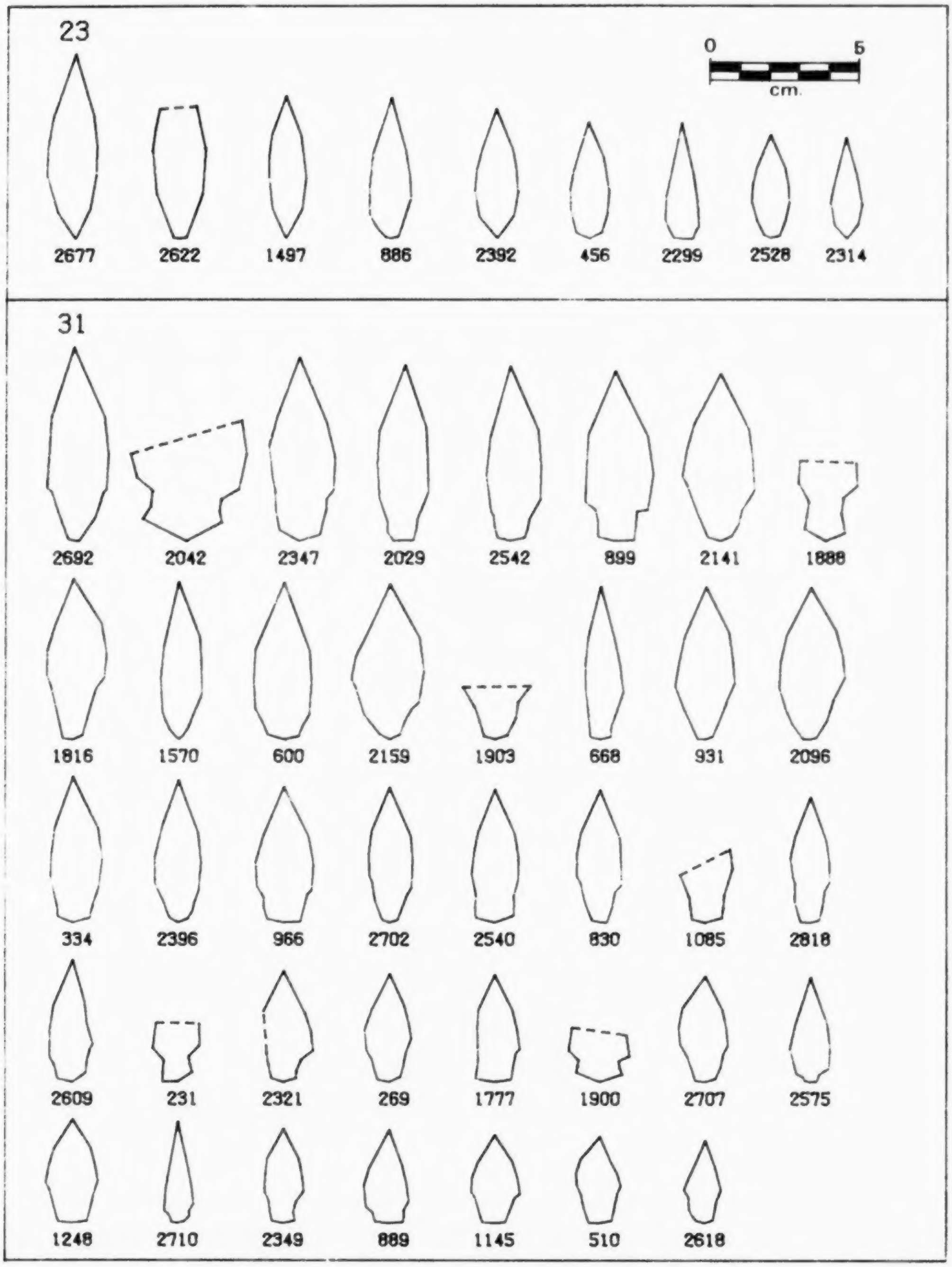

15
1019
21
1577
2586
2708
2595
1620
1109
1044
2398
922
253
364
2260
2070
238
2124
1516
525
1980
1775
2393
752
1666
357
454
974
1164
1908
1956
2248
2237
592
756
22
291
0
5
cm.

Figure B-1. Digitized outlines of projectile points, 45-OK-11. Upper number is historical type (for key see Figure 3-10). Number below each digitized outline is master number.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0
5
cm.
2677
2622
1497
886
2392
456
2299
2528
2314
31
2692
2042
2347
2029
2542
899
2141
1888
1816
1570
600
2159
1903
668
931
2096
334
2396
966
2702
2540
830
1085
2818
2609
231
2321
269
1777
1900
2707
2575
1248
2710
2349
889
1145
510
2618

Figure B-1. Cont'd.

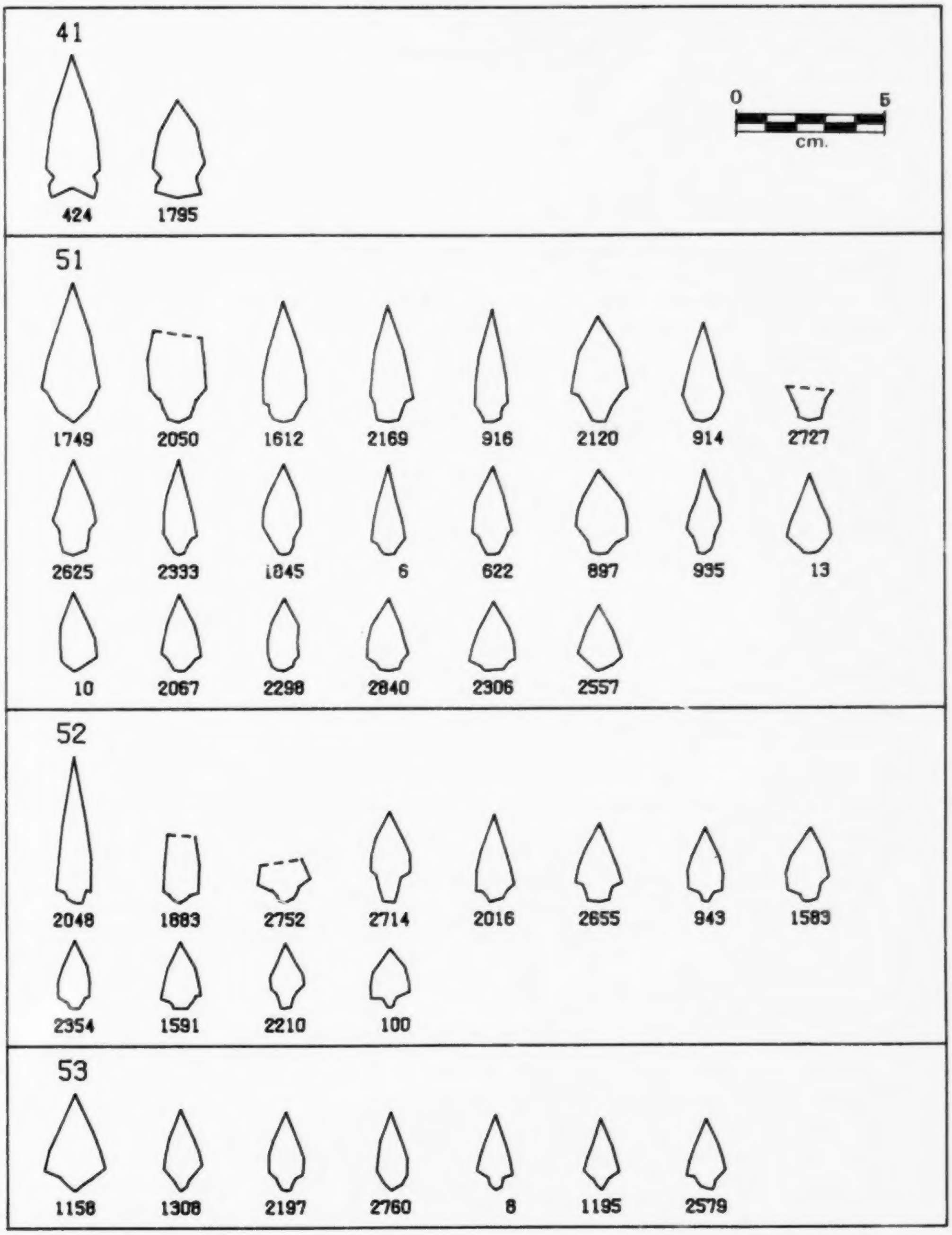
41
424
1795
0
5
cm.
51
1749
2050
1612
2169
916
2120
914
2727
2625
2333
1845
6
622
897
935
13
10
2067
2298
2840
2306
2557
52
2048
1883
2752
2714
2016
2655
943
1583
2354
1591
2210
100
53
1158
1308
2197
2760
8
1195
2579

Figure B-1. Cont'd.

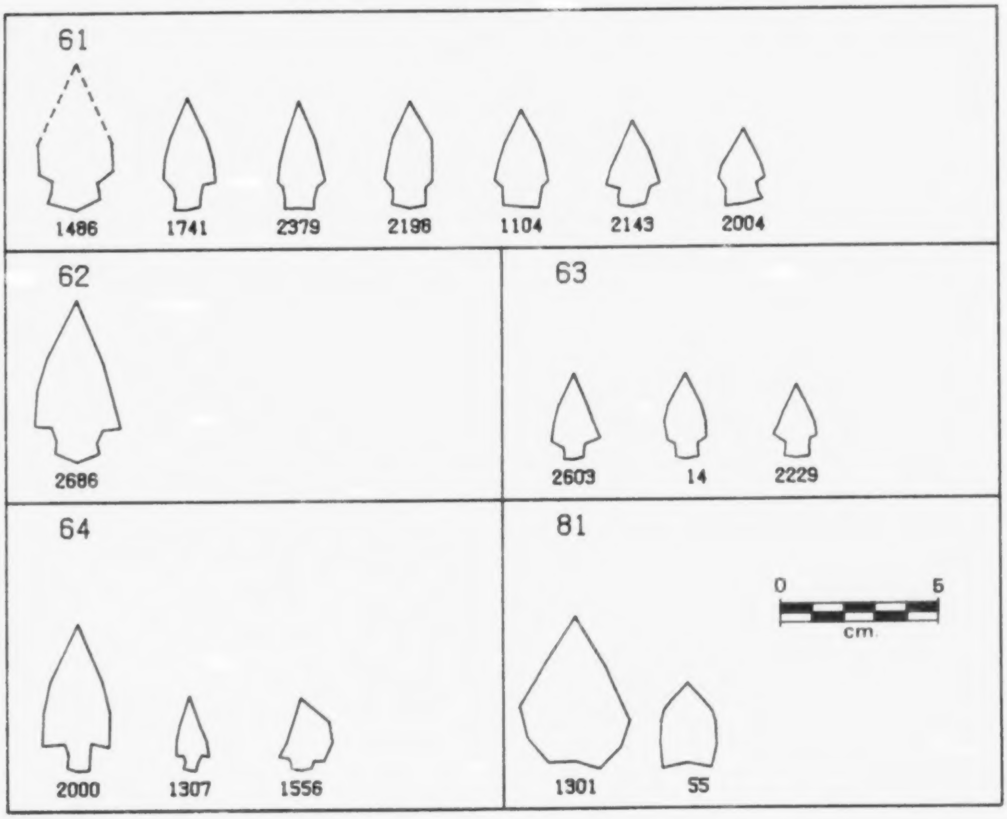
61
1486
1741
2379
2198
1104
2143
2004
62
2686
63
2603
14
2229
64
2000
1307
1556
81
0
5
cm.
1301
55

Figure B-1. Cont'd.

APPENDIX C:

FAUNAL ASSEMBLAGE, 45-OK-11

Family Leporidae

Lepus cf. _townsendii_

Hudnut Component: 1 radius fragment, 1 phalanx fragment.

Kartar Component: 2 mandible fragments, 4 molariform fragments, 2 humeri, 2 humerus fragments, 1 radius fragment, 1 astragalus, 2 phalanges.

Family Sciuridae

Spermophilus spp.

Hudnut Component: 2 maxilla fragments.

Kartar Component: 1 maxilla fragment, 1 mandible fragment, 1 scapula, 1 humerus fragment, 1 ulna fragment, 1 calcaneus.

Marmota flaviventris

Hudnut Component: 5 skull fragments, 6 mandible fragments, 1 incisor fragment, 5 molars, 5 molar fragments, 1 scapula, 1 scapula fragment, 2 humerus fragments, 1 radius fragment, 5 ulna fragments, 17 astragali, 2 calcanea, 4 phalanges, 4 phalanx fragments, 1 metapodial.

Kartar Component: 22 skull fragments, 7 mandibles, 24 mandible fragmentsm 3 incisors, 9 incisor fragments, 30 molars, 15 molar fragments, 1 axis, 2 cervical vertebrae, 3 thoracic vertebrae, 4 scapulae, 1 humerus, 6 humerus fragments, 11 radius fragments, 4 ulnae, 5 ulna fragments, 1 innominate fragment, 12 femur fragments, 10 tibia fragments, 34 astragali, 16 calcanea, 24 phalanges, 2 phalanx fragments, 9 metapodials.

Family Geomyidae

Thomomys talpoides

Hudnut Component: 6 skull fragments, 3 mandibles, 7 mandible fragments, 3 atlas vertebrae, 1 axis vertebra, 2 lumbar vertebrae, 3 scapulae, 9 humeri, 5 humerus fragments, 1 ulna fragment, 6 innominates, 1 innominate fragment, 8 femora, 2 femur fragments, 2 tibias, 1 tibia fragment.

Kartar Component: 8 skulls, 57 skull fragments, 72 mandibles, 60 mandible fragments, 2 incisors, 2 incisor fragments, 10 atlas vertebrae, 7 axis vertebrae, 4 cervical vertebrae, 2 thoracic vertebrae, 52 lumbar vertebrae, 5 sacra, 7 scapulae, 5 scapula fragments, 48 humeri, 6 humerus fragments, 8 radii, 11 ulnae, 8 ulna fragments, 21 innominates, 12 innominate fragments, 54 femora, 8 femur fragments, 35 tibias, 3 tibia fragments.

Unassigned: 1 skull fragment, 2 mandibles, 1 mandible fragment.

Family Heteromyidae

Perognathus parvus

Hudnut Component: 1 skull, 15 skull fragments, 21 mandibles, 7 mandible fragments, 6 humeri, 13 innominates, 20 femora, 7 tibias, 1 tibia fragment.

Kartar Component: 4 skulls, 42 skull fragments, 43 mandibles, 22 mandible fragments, 1 atlas vertebra, 6 sacra, 2 scapulae, 15 humeri, 2 radii, 1 ulna, 36 innominates, 2 innominate fragments, 45 femora, 17 tibias, 3 tibia fragments, 3 metapodials.

Family Castoridae

Castor canadensis

Hudnut Component: 1 mandible fragment, 4 molars.

Kartar Component: 1 mandible, 1 incisor, 5 molars, 1 ulna fragment, 1 phalanx.

Family Cricetidae

Hudnut Component: 1 skull fragment, 3 mandible fragments, 2 femora.

Kartar Component: 1 skull fragment, 1 mandible fragment, 1 humerus, 1 humerus fragment, 3 femora, 1 tibia.

Peromyscus maniculatus

Hudnut Component: 3 mandibles, 1 mandible fragment.

Kartar Component: 1 skull, 7 mandibles, 5 mandible fragments, 1 scapula.

Neotoma cinerea

Hudnut Component: 1 molar.

Microtus spp.

Hudnut Component: 1 mandible.

Kartar Component: 1 skull fragment, 4 mandibles, 9 mandible fragments.

Lagurus curtatus

Hudnut Component: 1 skull fragment, 2 mandible fragments.

Ondatra zibethicus

Kartar Component: 1 molar.

Family Erethizontidae

Erethizon dorsatum

Hudnut Component: 2 incisor fragments, 1 molar, 2 molar fragments, 1 femur fragment.

Kartar Component: 5 skull fragments, 2 mandibles, 6 mandible fragments, 3 incisors, 3 incisor fragments, 37 molars, 4 molar fragments, 2 scapula fragments, 1 radius fragment, 1 tibia fragment, 2 fibula fragment, 2 phalanges.

Family Canidae

Canis spp.

Hudnut Component: 2 mandible fragments, 2 canines, 4 premolars, 3 molars, 1 molar fragment, 1 fibula fragment, 4 phalanges.

Kartar Component: 1 mandible fragment, 2 incisors, 2 canine fragments, 2 premolars, 5 molars, 1 scapula, 1 radius fragment, 1 calcaneus fragment, 5 phalanges, 2 phalanx fragments.

Canis familiaris

Kartar Component: 3 premolars, 2 molars.

Canis lupus

Hudnut Component: 1 phalanx.

Kartar Component: 1 scapula, 1 metapodial fragment, 1 phalanx.

Vulpes vulpes

Hudnut Component: 1 phalanx.

Family Ursidae

Ursus americanus

Kartar Component: 1 molar fragment, 1 radius fragment, 1 calcaneus fragment, 1 phalanx.

Ursus arctos

Hudnut Component: 1 metapodial fragment.

Family Mustelidae

Martes americana

Kartar Component: 2 humerus fragments.

Taxidea taxus

Kartar Component: 1 ulna.

Mephitis mephitis

Kartar Component: 1 skull fragment, 1 mandible, 3 mandible fragment, 3 molars.

Family Felidae

Lynx spp.

Hudnut Component: 2 phalanges.

Kartar Component: 1 radius, 3 metapodials, 1 phalanx.

Family Cervidae

Hudnut Component: 14 antler fragments.

Kartar Component: 307 antler fragments.

Cervus elaphus

Hudnut Component: 21 antler fragments, 1 incisor, 2 phalanx fragments.

Kartar Component: 2 antler fragments, 3 skull fragments, 4 molar fragments, 1 ulna fragment, 5 carpals, 1 tibia fragment, 1 astragalus, 3 tarsals, 2 metapodial fragments, 2 phalanx fragments.

Odocoileus spp.

Hudnut Component: 24 antler fragment, 1 skull fragment, 6 mandible fragments, 13 incisors, 5 incisor fragments, 4 premolars, 1 premolar fragment, 14 molars, 134 molar fragments, 1 radius fragment, 4 carpals, 1 tibia fragment, 2 astragali, 2 calcanea, 1 calcaneus fragment, 2 metatarsal fragments, 3 phalanges, 6 phalanx fragments, 3 dewclaw fragments, 5 metapodial fragments.

Kartar Component: 51 antler fragments, 44 skull fragments, 102 mandible fragments, 94 incisors, 24 incisor fragments, 145 premolars, 90 premolar fragments, 215 molars, 331 molar fragments, 1 atlas fragment, 14 scapula fragments, 17 humerus fragments, 21 radius fragments, 4 ulna fragments, 26 carpals, 24 metacarpals, 12 innominate fragments, 2 femur fragments, 14 tibia fragments, 14 astragali, 2 astragalus fragments, 5 calcanea, 2 calcaneus fragments, 13 tarsals, 31 metatarsal fragments, 24 phalanges, 61 phalanx fragments, 18 dewclaw fragments, 31 metapodial fragments.

Unassigned: 2 molar fragments, 1 tarsal, 1 dewclaw fragment.

Family Antilocapridae

Antilocapra americana

Hudnut Component: 2 molars, 4 molar fragments, 2 radius fragments, 1 metatarsal fragment, 1 metapodial fragment.

Kartar Component: 1 skull fragment, 10 mandible fragments, 3 incisors, 14 premolars, 2 premolar fragments, 12 molars, 2 molar fragments, 1 scapula, 1 radius fragment, 1 tibia fragment, 1 astragalus, 1 phalanx, 2 phalanx fragments, 5 metapodial fragments.

Unassigned: 1 mandible fragment.

Family Bovidae

Bison bison

Hudnut Component: 2 phalanges.

Kartar Component: 1 mandible fragment, 3 molars, 2 molar fragments, 1 metacarpal fragment, 1 astragalus fragment, 1 metapodial fragment, 1 phalanx fragment.

Ovis canadensis

Hudnut Component: 3 incisors, 1 premolar, 2 molar fragments, 2 radius fragments, 1 ulna fragment, 3 astragali, 1 tarsal, 1 phalanx, 1 metapodial fragment.

Kartar Component: 68 horn core fragments, 5 shell fragments, 11 mandible fragments, 11 incisors, 2 incisor fragments, 35 premolars, 2 premolar fragments, 38 molars, 37 molar fragments, 6 atlas vertebrae, 5 atlas vertebra fragments, 3 axis vertebrae, 1 cervical vertebra, 10 scapula fragments, 7 humerus fragments, 12 radius fragments, 7 ulna fragments, 13 carpals, 3 metacarpal fragments, 3 feumur fragments, 3 tibia fragments, 9 astragali, 2 calcanea, 1 calcaneus fragment, 4 tarsals, 11 metatarsal fragments, 1 phalanx, 6 phalanx fragments, 19 metapodial fragments.

Family Hominidae

Homo sapiens

Kartar Component: 11 skull fragments, 1 radius fragment, 1 tibia fragment, 2 phalanges.

Deer-Sized

Hudnut Component: 10 skull fragments, 7 mandible fragments, 1 atlas vertebra fragment, 1 thoracic vertebra fragment, 3 lumbar vertebra fragments, 3 vertebra centrum fragments, 21 rib fragments, 6 scapula fragments, 11 humerus fragments, 9 radius fragments, 5 ulna fragments, 6 carpals, 2 carpal fragments, 8 metacarpal fragments, 4 femur fragments, 10 tibia fragments, 2 astragali, 6 astragalus fragments, 3 calcaneus, 3 tarsals, 1 tarsal fragment, 11 metatarsal fragments, 49 phalanx fragments, 5 dewclaw fragments, 30 metapodial fragments, 19 sesamoids.

Kartar Component: 83 skull fragments, 64 mandible fragments, 5 hyoid fragments, 5 atlas vertebra fragments, 5 axis vertebra fragments, 1 cervical vertebra, 12 cervical vertebrae fragments, 1 thoracic vertebra, 9 thoracic vertebra fragments, 24 lumbar vertebra fragments, 25 vertebra centrum fragments, 3 saccrum fragments, 2 caudal vertebra fragments, 343 rib fragments, 2 sternum fragments, 21 costal cartilage fragments, 53 scapula fragments, 97 humerus fragments, 84 radius fragments, 65 ulna fragemtns, 25 carpals, 15 carpal fragments, 50 metacarpal fragments, 41 innominate fragments, 69 femur fragments, 138 tibia fragments, 3 astragali, 24 astragalus fragments, 17 calcaneus fragments, 24 tarsals, 2 tarsal fragments, 102 metatarsal fragments, 152 phalanx fragments, 31 dewclaw fragments, 188 metapodial fragments, 30 sesamoids.

Unassigned: 1 humerus fragment, 1 ulna fragments, 2 radius fragments, 2 innominate fragments, 1 lumbar vertebra fragment, 1 sesamoid.

Sheep/Antelope

Hudnut Component: 5 incisors, 4 incisor fragments, 79 molar fragments.
Kartar Component: 19 incisors, 9 incisor fragments, 180 molar fragments.

Elk-Sized

Hudnut Component: 1 incisor, 1 cervical vertebra fragments, 1 femur fragment, 2 tarsals, 3 phalanx fragments.

Kartar Component: 2 skull fragments, 1 cervical vertebra fragment, 1 rib fragment, 2 humerus fragments, 2 radius fragments, 2 ulna fragments, 1 metacarpal fragment, 1 innominate fragment, 1 tibia fragment, 1 calcaneus fragment, 2 metatarsal fragments, 1 metapodial fragment, 2 phalanx fragments.

Family Chelydridae

Chrysemys picta

Hudnut Component: 123 shell fragments.

Kartar Component: 331 shell fragments.

Family Colubridae

Hudnut Component: 118 vertebrae, 2 vertebra fragments.

Kartar Component: 89 vertebrae, 1 vertebra fragment.

Unassigned: 1 vertebra.

Family Ranidae/Bufonidae

Hudnut Component: 5 radio ulnas, 3 innominates, 3 astragulus.

Kartar Component: 8 skull fragments, 2 vertebrae, 4 humeri, 2 humerus fragments, 14 radio ulnas, 7 innominate fragments, 6 femora, 2 tibio fibulas, 16 astragali.

Family Salmonidae

Hudnut Component: 11 vertebrae, 52 vertebra fragments.

Kartar Component: 57 vertebrae, 219 vertebra fragments.

Family Cyprinidae

Hudnut Component: 108 vertebrae, 30 vertebra fragments.

Kartar Component: 418 vertebrae, 104 vertebra fragments.

Unassigned: 1 vertebra.

Table C-1. Distribution of butchering marks and burned bone by taxon, 45-OK-11.

Element	Hudnut Component					Kartar Component					
	1	2	3	5	B*	1	2	3	5	6	B
Lepus cf. *townsendii*											
first phalanx					1						
Marmota flaviventris											
teeth					2						2
mandible											2
scapula											1
astragalus					2						3
first phalanx					3						3
second phalanx					1						1
Thomomys talpoides											
humerus, distal					1						
femur, shaft					1						
Castor canadensis											
mandible	1										
Peromyscus maniculatus											
mandible											1
Erethizon dorsatum											
teeth											1
Vulpes vulpes											
second phalanx					1						
Ursus americana											
radius, distal											1
Mephitis mephitis											
teeth											1
Lynx sp.											
metapodial, distal						1					
Cervid											
antler			1	3	3		1		14		35
Cervus elaphus											
antler					3				1		
tarsal											2
Odocoileus spp.											
antler				1	3						
teeth					2						9
mandible						1	9				2
scapula											3
humerus, distal						1	1	1	1		1
radius, proximal		1					3	1			
radius, distal											1
metacarpal, proximal						1					
metacarpal, shaft							1				
metacarpal, distal	1						3		1		
tibia, distal							2				2
tarsals							1				2
metatarsal, proximal							5	1			
first phalanx							1				1
second phalanx					1						1
third phalanx											2
metapodial, distal					2		1				3
Antilocapra americana											
teeth											1
radius, proximal					1						
astragalus											1
third phalanx											1
metapodial, distal											1
Bison bison											
metacarpal, proximal							1				
Ovis canadensis											
teeth											20
skull											1
mandible							1				2
atlas						1					6
axis											2
cervical											1
scapula						1					
humerus, distal							2				
radius proximal		1				1	2				

Table C-1. Cont'd.

Element	Hudnut Component					Kartar Component					
	1	2	3	5	B	1	2	3	5	6	B
Ovis canadensis cont'd											
astragalus	1										
tarsals											1
metatarsal, proximal							1				
third phalanx											1
metapodial, distal											49
Deer-sized											
skull					2						20
mandible						1	1				5
atlas											2
axis											1
cervical											4
lumbar											1
vertebrae											3
sacrum						1					
rib					5				1		37
scapula					1		2				5
humerus, shaft							36			1	9
humerus, distal		3									
radius, shaft		1					30				2
radius, distal					1						2
ulna, proximal											2
ulna, shaft									2		1
carpals											3
metacarpal, proximal					1						1
metacarpal, shaft	4				3		18		5		2
innominate											5
femur, shaft							28				4
femur, distal										1	
tibia, proximal											1
tibia, shaft		2					41		2		3
tibia, distal											2
astragalus											1
calcaneus											5
tarsals					3						
metatarsal, proximal					3						3
metatarsal, shaft		2		1	1		32		5		4
first phalanx					4		2				8
second phalanx					1						1
third phalanx					1						2
metapodial, distal					1						10
metapodial, proximal		1			1						3
metapodial, shaft			1		2		33		15		10
sesamoid					3						3
Elk-sized											
skull				1							
radius, proximal											1
radius, shaft							1				
femur, shaft		1			1						
tibia, shaft						1					
metatarsal, shaft							1				
Sheep/Antelope											
teeth											11
Chrysemys picta											
shell					12						24
Salmonidae											
vertebrae					15						42
Cyprinidae											
vertebrae					16						31

*Key:
1 = striae
2 = flake scar
3 = chopping scar
4 = burned

APPENDIX D:

FEATURE ASSEMBLAGE, 45-OK-11

Table D-1. Provenience of 45-OK-11 features and associated field numbers.

Area	Component	Zone	Feature Type	Included Feature	Field Designation	Provenience/Level
1	Hudnut	1	Firepit		11	60N68E/60-70
			Firepit		13	38N68E/5
			Firepit		29	10N70E/50-60
			Firepit		30	24N65E/50-60
	Kartar	2	Housepit 2	Floor/wall	12	13N62E,13N63E,14N61E/140-180
				Fill	750	14N62E/?
			Housepit 3	Floor	17	59N68E,59N69E,60N68E/110,120
				Fill	250	60N68E
				Shell concentration[1]	42	60N68E/80-120
			Housepit 5	Fill (upper)	300	38N68E/140-160
				Fill (lower)	301	38N68E/140-180
				Shell concentration (upper)	44	38N68E/140-160
				Shell concentration (lower)	43	38N68E/160-190
			Housepit 6	Floor (upper)	401	42N66E,44N62E
				Floor (lower)	21,403	42N66E/195
				Wall	52	44N62E/110-170
				Fill (upper)	400	42N66E,44N62E
				Fill (lower)	402	42N66E
			Housepit 7	Floor/fill	500	52N72E/?
				Shell concentration[1]	2,36	
			Housepit 9	Floor	36,51	4N60E/215-220,0S62E/220
				Fill	350	4N60E/190-230
			Housepit 11	Floor	57	66N58E/120
			Firepit		32	4S74E/170-200
			Pit		34	32N64E/140-160
			Pit		35	62N66E/160
			Shell Concentration		36	10N70E/210-230
			Shell Concentration		39	62N66E/60-70
			Shell Concentration		40	62N66E/80-100
			Shell Concentration		41	4S74E/170-230
			Shell Concentration		45	6N60E/190-210
			Shell Concentration (upper)		49	0S62E/100-130
			Shell Concentration (lower)		50	0S62E/170-230
			Shell Concentration		62	66N58E/80,90
			Stain		25	8N74E/180
			Stain		191	72N86E/20-30
2	Hudnut	1	None			

Table D-1. Cont'd.

Area	Component	Zone	Feature Type	Included Feature	Field Designation	Provenience/Level
2	Hudnut	2	Firepit	-	27	20N66E/50-60
		3	None		-	-
	Kartar — lower	4	Occupation Surface	-	47	20N66E/170-200
			Occupation Surface	-	20,48	22N66E/210-220
			Occupation Surface	-	157	18N66E/190-210
			Occupation Surface	-	158	24N66E/220-230
			Occupation Surface	-	177	18N68E/200-210
			Occupation Surface	-	451	20N66E/200-210
			Occupation Surface A	-	19,155,168,169, 171,159, 162,	See Figure 6-1
				Firepit Firepit	161 167	
	Kartar — upper	4	Shell Concentration	-	37	16N68E/160
			Shell Concentration	-	38,174	16N68E/160-200,18N68E/170-190
			Shell Concentration	-	46	20N66E/130-150,22N66E/130-140
			Occupation Surface	-	154,156	24N66E/160-210
			Occupation Surface	-	170,172	24N68E/190-220
			Stain	-	163	18N62E/170
			Stain	-	166	22N62E/200
			Debris Concentration	-	165	24N62E/170-200
			Bone Concentration	-	164	18N62E/170
		5	None	-	-	-
3	Hudnut	1	None	-	-	-
		2	FMR Scatter	-	110	18N56E,18N58E,20N58E/40-60
	Kartar	3	Shell Concentration	-	116	18N59E,20N58E/70-100
		4	Occupation Surface	-	117	18N56E,18N58E,20N56E,20N56E/110-130
		5	Cultural Stratum	-	121	18N56E,18N58E,20N56E,20N56E/150-180
			Shell Concentration		124	20N56E/160
			Shell Concentration		127	20N56E,20N58E/170
			Occupation Surface B		33,56,122	20N54E/160,20N56E/160
		6	Occupation surface		141	18N58E,20N58E/160-200

Table D-1. Cont'd.

Area	Component	Zone	Feature Type	Included Feature	Field Designation	Provenience/Level
4	Hudnut	1	None			
		2	FMR Concentration		178	36N64W/40-50
			Firepit		179	36N64W/40-50
			Firepit		187	34N64E/50,60
			FMR Scatter		173	32N64E/30-50
			FMR Scatter		175	34N62E/40-60
		3	Firepit		15/16	?
	Kartar	4	Housepit 4	Fill	200	See Figure 6-1
		5	Housepit 4	Floor	181,183,192, 193,194	
		5	Housepit 4	Wall	180,186,188, 201	
		6	Occupation Surface		185	32N60E/150-180,32N64E/140-160, 36N64E/160-175,36N60E/165-190
5	Hudnut	1	None			
		2	Firepit		4	76N72E/50
			Firepit		22	80N68E/60
			Firepit		58	74N60E/40
			Firepit		65	72N70E/40-50
			FMR Scatter		60	72N72E/20,30
			FMR Scatter		148	74N74E/50-70
			Lithic Concentration		59	76N64E/50
	Hudnut/ Kartar	3	Occupation Surface (in Housepit 1 fill)		53,64,68,76, 55,63,78	See Figure 6-14
				Firepit	79	78N70E/110
				Pit	24	80N68E/130
				Pit	81	78N70E/125
				Lithic Concentration	28	76N66E/70
		4	None			
	Kartar	5	Pit		72	72N68E/130-140
			Pit		113	78N60E/120,130,140
			Bone Concentration		120	82N62E/90,95
		6	None			

Table D-1. Cont'd.

Area	Component	Zone	Feature Type	Included Feature	Field Designation	Provenience/Level
6	Karter	1	Housepit 1 (upper)	Floor	31,71,112,125	74N62E/90-100,82N66E/130,135
				Wall	5,77,103,149	72N60E/100,74N72E,74N76E/60-140 80N60E/60-70
				Wall	102,150	74N74E,74N76E/80-120,82N68E/130-145
				Fill	100	
				Firepit	7	80N66-67E/150
				Firepit	88,92	78N68E/145-165
				Pit	70	78N64E/140-155,78N66E/145-156
				Pit	80	78N66E/145-155
		2	Lower Housepit 1 fill	Fill (upper)	89,98,104,106 128	See Figure 6-1
				Fill (lower)	105	80N70E,82N68E/155,160
		3	Housepit 12	Floor/Fill	69,153	72N70E/130-230
		4	Housepit 11	Floor	72,82,83	72N60E/140-160
				Fill	61	74N62E/130
				Firepit	74	72N62E/140
		5	Housepit 1 (lower)	Floor	93,94,95,96 107,130	See Figure 6-11
				Wall	6,129,137,140	
				Wall	114,115,134 139,143	
				Firepit	10	76N62E/150,160
				Firepit	109	82N68E/160,165
				Pit	14,135	76N72E,78N72E/130-150
				Pit	91	78N66E/200
				Pit	108,123	74N66E/165-175,76N64E,76N66E/160-170
				Pit	111	76N66E/170-175
				Pit	119	74N64E/125-145,74N66E/140,145
				Pit	131	78N68E/180,185,190
				Pit	138	84N70E/125,130
7	Karter	1	None	-	-	-
		2	Bone Concentration	-	3,8,9	See Figure 6-1
8	Karter	1	None	-	-	-
		2	Pit	-	2	125N54E,126N54E/60,70

[1] In fill.

Table D-2. Material quantities by feature, 45-OK-11.

Cultural Feature	Debitage	Tools		Bone		Shell		FMR		Estimated
		Lithic	Bone	N	wt (g)	N	wt (g)	N	wt (g)	Volume (m^3)
KARTAR PHASE										
Upper Housepit 1										
Fill (F100)	4,625	188	75	33,413	7,356	6,176	24,051	818	104,080	46,866
Wall (F5, 103, 149, 77)	1,373	72	13	11,231	3,379	43,954	235,686	582	85,573	16,82
Early Wall (F102, 150)	52	2	2	204	103	6,918	886	54	8,860	0,452
Floor (F31, 71, 112, (125)	1,224	81	28	10,230	3,466	1,619	9,299	507	55,663	6,433
Floor Features:										
Firepit (F7)	36	4	-	53	11	9	75	61	6,850	0.167
Firepit (F88, 92)	13	1	2	199	62	24	75	25	1,973	0.275
Pit (F70)	4	2	-	202	69	115	955	3	266	0.093
Pit (F80)	6		-	10	1	-	1	-	-	0.058
Lower Housepit 1										
Upper Fill (F104, 89, 98 108, 128)	761	22	11	6,902	3,072	4,245	19,848	164	37,050	21,70
Lower Fill (F105)	14	-	1	152	76	715	4,196	3	510	0.325
Wall (F6, 129, 137, 140)	436	16	4	2,038	1,052	15,385	70,605	228	27,474	3,488
Early Wall (F114, 115, 134, 139, 143)	202	3	2	707	268	2,854	15,748	53	11,592	2,229
Floor (F93, 94, 95, 96, 101, 107, 130)	429	24	2	2,585	1,450	3,520	17,703	166	36,698	7,866
Floor Features:										
Firepit (F10)	6	-	-	19	10	88	694	2	210	0,03
Firepit (F109)	2		-	1	-	1	-	13	8,150	0.115
Pit (F14, 135)	13	-	-	32	15	348	2,451	12	5,332	0.34
Pit (F91)	1		-	2	-	-	-	-	-	0.15
Pit (F108, 123)	-	-	-	1	-	15	68	-	-	0.212
Pit (F111)	-	-	-	3	-	21	185	-	-	0.042
Pit (F131)	2	1	-	9	2	2	3	-	-	0.133
Pit (F138)	1		-	-	-	99	1,208	-	-	0.033
Pit (F119)	-	-	-	4	1	3	9	-		0.125
Bone Concentration (F120)			-	18	242		-			0.125
Housepit 2										
Fill (F750)	48	4	2	232	178	532	4,079	-	-	1,70
Wall Floor (F12)	12	5	1	79	71	1,267	10,500	13	3,380	0,40
Housepit 3										
Fill (F250)	72	2	3	805	174	2,223	13,311	11	1,002	0,780
Shell Concentration (F42)	4	1	3	182	78	2,244	16,366	3	335	0,267
Floor (F17)	2	-	-	204	74	189	1,354	7	1,040	0.133
Housepit 4										
Fill (F200)	374	21	10	3,807	1,873	1,551	2,124	116	15,129	12,442
Firepit in Fill (F15)	-	-	-	52	22	15	103	-	-	0.18
Wall (F180, 186, 188, 201)	146	16	4	1,767	1,586	2,442	470	135	24,569	4,392
Floor (F181, 183, 192, (193, 194)	101	28	5	1,383	1,389	3,425	-	242	73,296	3,116
Housepit 5										
Upper Fill (F300)	8		1	205	70	99	992	6	1,159	0.153
Upper Shell (F44)	5			63	66	172	2,144	-	-	0.208
Lower Fill (F301)	3	1	-	270	77	83	759	1	167	0.292
Lower Shell/Floor (F43)	5	2	-	241	36	504	3,833	11	1,322	0.283

Table D-2. Cont'd.

Cultural Feature	Debitage	Tools		Bone		Shell		FMR		Estimated
		Lithic	Bone	N	wt (g)	N	wt (g)	N	wt (g)	Volume (m^3)
KARTAR PHASE, cont'd.										
Housepit 6										
Upper Fill (F400)	36	2	1	826	248	330	2,798	5	960	1.30
Wall (F52)	17	-	-	60	195	442	4,696	-	-	0.45
Upper Floor (F401)	9	2	2	231	208	249	1,812	1	160	0.542
Lower Fill (F402)	19	-	-	225	34	232	1,679	2	350	0.46
Lower Floor (F403, 21)	17	2	1	240	26	549	3,672	9	1,059	1.06
Housepit 7										
Shell Stratum (F23, 86)	36	1	1	1,901	787	10,540	41,186	55	3,936	0.825
Fill and Floor (F500)	98	2		7,260	1,862	150	1,106	3	60	7.25
Housepit 9										
Fill (F350)	29	-	1	188	132	349	1,814	20	3,950	0.683
Upper Shell (F49)	11	1	2	109	65	6,042	34,929	72	7,122	0.55
Shell Concentration (F45)	1	-	-	31	15	885	5,450	1	80	0.158
Lower Shell (F50)	11	1		53	15	2,032	20,285	47	8,273	0.50
Floor (F26, 51)	10			97	15	67	396	19	3,076	0.375
Housepit 11										
Fill (F61)	98	9	-	1,853	372	344	2,031	11	2,229	2.95
Floor (F57, 75, 82, 83)	145	7	3	645	330	605	5,276	87	27,110	1.00
Firepit (F74)	2	1	-	22	24	3	24	3	1,228	0.05
Housepit 12										
Fill and Floor (F69, 152)	28		-	216	106	542	2,715	11	4,070	3.90
Firepit										
F20	-	-	-	20	10	1	2	3	80	0.083
F32	6	1		13	9	28	240	3	2,646	0.233
Pits										
F2	-			-		-		-		0.15
F34	2		-	28	20	3	16	-	-	0.09
F35	7	1	1	3	0	2	9	7	2,416	.03
F72	-			-		2	14	-	-	0.10
F113	2			2		2	8	2	210	0.10
Shell Concentrations										
F36	1			10	7	705	6,123	12	2,220	0.35
F37	1	-		11	12	62	698	-	-	0.08
F38, 171	44	2	-	494	132	5,482	26,363	87	15,588	0.892
F39	9			21	4	1,240	8,068	3	398	0.40
F40	27	1	-	75	52	3,810	20,511	27	2,905	0.50
F41	174	15	2	550	1,042	6,772	50,933	197	28,266	0.908
F46	11	1	-	158	36	1,549	15,607	3	290	0.40
F62	2	1		27	40	727	2,989	8	2,284	0.25
F116	64	2	-	165	35	265	2,254	30	1,380	0.55
F124	1		-	6	1	43	-	-	-	0.042
F127			1	8	2	122	845	2	240	0.083
Occupation Surface A										
Periphery (F155, 168, 19, 171)	94	8	2	2,728	901	1,331	638	129	26,371	4.97
Central (F169, 159)	13	1	1	324	96	372	1	44	14,560	1.356
Firepit (F167)		-	-	3	1	58	-	7	400	0.108
Firepit (F161, 162)	1			42	26	656		64	9,360	0.397
Occupation Surface B										
Lithic Concentration (F33)	317	3	-	56	4	-	-	-		0.10
Central Living Surface (F56)	94	1		29	85	24	154	6	1,330	0.20
Disposal Zone (F122)	104	6	1	222	534	57		12	900	0.30

Table D-2. Cont'd.

Cultural Feature	Debitage	Tools		Bone		Shell		FMR		Estimated
		Lithic	Bone	N	wt (g)	N	wt (g)	N	wt (g)	Volume (m³)
KARTAR PHASE, cont'd.										
Occupation Surface in Upper Housepit 1 Fill (F64, 53, 54, 68, 76, 78, 63, 55)	362	16	6	4,081	979	5,129	21,965	261	48,764	2,70
Firepit (F79)	2	–	–	34	5	6	34	5	4,000	0,05
Chipping Station (F28)	347	2	–	–	–	–	–	1	220	0,20
Pit (F24)	2	–		12	3	–	–	–	–	0,006
Pit (F81)	–			22	5	6	40			0,10
Occupation Surfaces										
F47	11	–	1	99	102	433	2,904	13	2,920	0,217
F48	13	1	–	366	110	13	73	–	–	0,25
F117	410	27	2	1,082	223	486	3,259	146	20,780	2,95
F141	222	7	3	1,368	1,470	207	1,791	8	1,730	1,3
F154, 156	310	8	3	5,252	1,786	121	–	–	–	1,042
F157	1	–	–	960	506	8	1	–	–	0,35
F158	–	–	–	57	143	7	–	–	–	1,83
F170, 172	857	15	2	14,107	5,331	178	0	137	11,178	0,85
F177	–	–	–	4	2	78	–	2	560	0,10
F185	14	3	2	42	18	86	2	2	440	0,25
F451	14	2	1	342	253	126	1,064	7	1,250	0,30
Stains										
F25	–			1	1	–			–	0,10
F163	4	–	2	84	50	23	–	2	70	0,20
F166	–				–	1	4	–	–	0,208
F191	2	–	–	5	1	53	–			0,083
Cultural Stratum										
F121	21	6	2	133	249	367	4,150	46	9,610	0,633
Debris Concentration										
F165	6			280	86	18		4	520	0,80
Bone concentration										
F164	2	–	1	162	162	6				0,10
Area 7 Bone Concentration										
F3	91	7	2	2,659	3,946	13	66	12	2,168	0,633
F8	24	3	–	1,207	1,705	12	47	1	350	0,25
F9	6	7	1	769	1,667	276	1,268	26	3,180	0,383
Unfeatured Levels	–			18,472	5,992		–	–	–	4,60
HUDNUT PHASE										
Firepits										
F4	1	1		6	1	–	–	15	3,137	0,01
F11	–	–		8	1		–	2	2,200	0,003
F13	1	–	–	8	1	–		–	–	0,002
F22	–	–	–	–		–	–	25	8,440	0,05
F27	30	1	–	123	14	–	–	18	2,260	0,06
F29	–	1		2					–	0,02
F58				1	–		–	44	15,592	0,03
F65	1		–	18	4	2	5	17	7,130	0,03
F187	6		–	8	1			12	2,580	0,03
F190	6			11	1	–		16	18,890	0,02
FMR Scatters										
F60[1]	1	–	–	5	–	–	–	44	12,010	0.15
F110	272	10	1	272	44	9	45	157	20,350	1.45
F148[1]		–	–	–	–	–	–	71	8,630	0.80
F173		–	–			–	–	132	19,685	0.80
F175	–	1	–			–		86	12,186	0.60
FMR Concentration										
F179	3	–	–	5	–		–	50	18.360	0.003
F178	12	1	–	21	2	–	–	30	21,720	0.08
Lithic Concentration										
F59	19	2	–	–	–	–	–	–	–	0.0012

[1] Content Feature only FMR collected as part of feature; other material as unit level.

Table D-3. Occurrence of stone tools by feature, 45-OK-11.

Cultural Feature	Utilized Only	Unifacially retouched flake	Bifacially retouched flake	Resharpening flake	Burin spall	Biface	Projectile point	Projectile point base	Projectile point tip	Blade	Drill	Graver	Burin	Scraper	Core	Tabular knife	Hammerstone	Maul	Pestle	Edge-ground cobble	Bead	Chopper	Peripherally flaked cobble	Amorphously flaked cobble	Millingstone	Hopper mortar base	Anvil	Shaft abrader	Indeterminate	Total
KARTAR PHASE																														
Upper Housepit 1																														
Fill (F100)	52	19	13	2	1	26	12	7	7	-	1	3	1	5	1	7	7	-	-	1	-	5	-	-	2	-	-	2	4	176
Wall (F5, etc.)	5	2	1	1	-	6	1	2	2	-	-	-	-	-	-	15	6	-	2	-	-	22	-	1	2	-	-	-	4	72
Early wall (F102, 150)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2
Floor (F31, etc.)	25	9	6	-	-	9	1	2	5	2	2	-	-	2	-	1	3	-	-	-	-	7	-	-	3	-	-	-	4	81
Firepit (F7)	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4
Firepit (F88, 92)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
PIT (F70)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
Lower Housepit 1																														
Upper fill (F104, etc.)	2	1	-	-	-	2	1	2	2	-	-	-	-	-	-	5	1	-	-	-	-	3	-	-	1	1	-	-	1	22
Wall (F6, etc.)	1	1	-	-	-	1	3	-	-	-	-	-	-	-	1	2	2	-	1	-	-	1	-	-	1	-	-	1	1	16
Early wall (F114, etc.)	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3
Floor (F101, etc.)	-	4	2	-	-	-	1	-	1	-	-	-	-	-	-	1	3	-	-	-	-	8	1	-	-	2	1	-	-	24
Pit (F131)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Housepit 2																														
Fill (F750)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	4
Wall/floor (F12)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	1	5
Housepit 3																														
Fill (F250)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2
Shell Concentration (F42)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Housepit 4																														
Fill (F200)	2	3	-	-	-	5	2	-	-	1	-	-	-	-	-	1	-	1	-	-	-	5	-	-	1	-	-	-	-	21
Wall (F180, etc.)	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	8	-	2	1	-	-	-	1	16
Floor (F181, etc.)	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	1	-	-	-	-	6	1	-	4	-	1	-	5	28
Housepit 5																														
Lower fill (F301)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Lower shell/floor? (F43)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2
Housepit 6																														
Upper fill (F400)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	2
Upper floor (F401)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
Lower floor (F403, 21)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	3
Housepit 7																														
Fill and floor (F500)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2
Shell stratum	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

Table D-3. Cont'd.

Cultural Feature	Utilized Only	Unifacially retouched flake	Bifacially retouched flake	Resharpening flake	Burin spall	Biface	Projectile point	Projectile point base	Projectile point tip	Blade	Drill	Graver	Burin	Scraper	Core	Tabular knife	Hammerstone	Maul	Pestle	Edge-ground cobble	Bead	Chopper	Peripherally flaked cobble	Amorphously flaked cobble	Millingstone	Hopper mortar base	Anvil	Shaft abrader	Indeterminate	Total
KARTAR PHASE																														
Housepit 11																														
Fill (F61)						1	1															6			1					9
Floor (F57, 75, etc.)			1						1													3		2						7
Firepit (F74)																						1								1
Housepit Totals																														
Fill	57	23	13	2	1	35	17	9	9		1	3	1	5	1	15	8	1		1		25		2	5	1		2	5	242
Walls	7	5	1	1		8	4	2	2	1	1				1	19	9		3			32		3	4			1	6	110
Floors and floor feature	32	15	10			9	3	2	8	2	2			2		9	8					33	2	4	7	2	2		11	163
Total	96	43	24	3	1	52	24	13	19	3	4	3	1	7	2	43	25	1	3	1		90	2	9	16	3	2	3	22	515
Pits																														
F35																						1								1
Firepits																														
F32			1																											1
Shell Concentrations																														
F38, 174			1				1																							2
Lower shell (F40)																						1								1
F41	1	1					1					1				6	1					4								15
F46																								1						1
Upper shell (F49)																						1								1
Lower shell (F50)																						1								1
F62																1														1
F116	1			1																										2
Occupation Surface A																														
Periphery (F155, etc.)	1		3													1						2							1	8
Central (F169, 159)						1																								1
Occupation Surface B																														
Chipping station (F33)	1			2																										3
Central living surface (F56)						1																								1
Disposal zone (F122)	2					1			1													2								6
Occupation Surface in upper fill (F64, etc.)	5	1	1			1	1	1	1						1		2					2								16
Chipping station (F28)		1					1																							2

Table D-3. Cont'd.

Cultural Feature	Utilized Only	Unifacially retouched flake	Bifacially retouched flake	Resharpening flake	Burin spall	Biface	Projectile point	Projectile point base	Projectile point tip	Blade	Drill	Graver	Burin	Scraper	Core	Tabular knife	Hammerstone	Maul	Pestle	Edge-ground cobble	Bead	Chopper	Peripherally flaked cobble	Amorphously flaked cobble	Millingstone	Hopper mortar base	Anvil	Shaft abrader	Indeterminate	Total
Occupation Surfaces																														
F48	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
F117	4	2	2	1	-	6	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	7	-	-	1	-	-	-	1	27
F141	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	2	-	-	-	-	-	7
F154, 156	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	8
F170, 172	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9	1	-	-	-	-	2	-	-	-	-	-	-	-	15
F185	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3
F451	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
Cultural Stratum																														
F121	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	2	6
FMR Concentration																														
F3	1	-	-	-	-	1	-	1	-	-	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	7
F8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	3
F9	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	1	-	-	1	-	-	-	-	7
Total	24	6	8	4	-	13	6	2	3	-	-	1		2	4	27	8	-	-	-	1	29	-	3	2	-	-	-	4	147
HUDNUT PHASE																														
Firepits																														
F4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
F27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
F29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
FMR Concentration																														
F178	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
FMR Scatters																														
F110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F175	3	1	-	-	-	2	-	-	-	-	-	1	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1	9
Lithic Concentration																														
F59	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Total	5	1	-	1	-	2	-	-	1	-	-	1	-	1	-	1	3	-	-	-	-	-	-	-	-	-	-	-	1	15

Table D-4. Occurrence of bone tools by feature, 45-OK-11.

Feature Type	Blunted end	Point	Unbarbed harpoon unipoint	Needle	Shuttle	Awl	Chisel/Adze	Wedge	Bead	Other formed object	Proximal end of metapodial/ long bone shaft	Pointed fragment	Edge end	Square/rounded end	Blunted end	Flaked long bone	Other formed fragments	Technologically modified only	Indeterminate	Total
KARTAR PHASE																				
Upper Housepit 1																				
Fill (F100)	1	-	1	1	-	1	-	-	-	2	-	14	-	1	1	5	10	32	6	75
Wall (F5,etc.)	-	2	-	-	-	-	-	1	-	1	-	2	-	-	-	3	1	4	-	13
Early Wall (F102,150)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1*	2
Floor (F31,etc.)	-	1	-	-	-	-	1	4	1*	-	1	1	1	-	-	-	5	12	1	28
Firepit (F88,92)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Lower Housepit 1																				
Upper Fill (F104,etc.)	-	-	-	1	-	-	1	1	-	-	-	2	1	-	-	-	3	2	-	11
Lower Fill (F105)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Wall (F6,etc.)	-	1	-	-	-	-	-	-	1*	-	-	-	-	-	-	1	-	1	-	4
Early Wall (F114,etc.)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	2
Housepit 2																				
Fill (F750)	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	2
Wall/Floor (F12)	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Housepit 3																				
Fill (F250)	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	-	3
Housepit 4																				
Fill (F200)	-	-	-	-	-	1	-	2	-	1	-	2	-	-	-	1	-	3	-	10
Wall (F180,etc.)	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	1	-	-	4
Floor (F181,etc.)	-	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	2	-	-	5
Shell Conc. (F42)	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	-	3
Housepit 5																				
Upper Fill (F300)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Housepit 6																				
Upper Fill (F400)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Upper Floor (F401)	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2
Lower Floor (F403,21)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Housepit 7																				
Shell Stratum (F23/86)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Housepit 9																				
Fill (F350)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Floor (F101,etc.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2
Housepit 11																				
Floor (F57,75,etc.)	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3
TOTALS																				
Housepit Fill	1	-	1	2	-	3	1	3	-	6	-	23	1	1	1	7	17	38	6	111
Housepit Walls	-	2	-	-	-	-	1	2	1	2	-	4	-	-	-	4	3	5	1	25
Housepit Floor and Floor Features	-	1	-	-	1	1	1	5	1	1	1	6	1	-	-	1	8	15	1	44
TOTAL	1	3	1	2	1	4	3	10	2	9	1	33	2	1	1	12	28	58	8	180

Table D-4. Cont'd.

Feature Type	Blunted end	Point	Unbarbed harpoon unipoint	Needle	Shuttle	Awl	Chisel/Adze	Wedge	Bead	Other formed object	Proximal end of metapodial/ long bone shaft	Pointed fragment	Edge end	Square/rounded end	Blunted end	Flaked long bone	Other formed fragments	Technologically modified only	Indeterminate	Total
KARTAR PHASE, cont'd.																				
Pits																				
F35	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
Shell Concentrations																				
F41	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–	2
F127	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Upper Shell (F49)	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	2
Occupation Surface A																				
Periphery (F155,etc.)	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	2
Central (F160,159)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Occupation Surface B																				
Disposal Zone (F122)	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
Occupation in Upper Fill (F64,etc.)	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	4	–	6
Occupations Surfaces																				
F47	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1
F117	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	2
F184	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2
F141	–	–	–	–	–	–	–	–	1*	–	–	1	–	–	–	–	1	–	–	3
F154, 156	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	3
F170, 172	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	2
F451	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Stains																				
F183	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	2
Cultural Stratum																				
F121	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	2
Bone Concentrations																				
F164	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
Area 7 Bone Concentration																				
F3	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	2
F9	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1
TOTALS	1	1	–	–	–	5	–	–	[illegible]	1	–	10	1	1	–	–	10	6	1	38
HUCHNUT PHASE																				
FMR Scatter																				
F110	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

*Shell

Table D-5. Occurrence of faunal remains by feature, 45-OK-11.

Feature Type	Deer	Deer-sized	Elk	Elk-sized	Cervidae, antler	Mountain sheep	Pronghorn	Sheep/Antelope	Bison	Bear	Dog	Canis sp.	Fox	Beaver	Jackrabbit	Skunk	Porcupine	Marten	Marmot	Salmon	Salmonidae	Cyprinidae	Turtle	Frog	Snake	Pocket gopher	Pocket mouse	Other mouse
KAHTAR PHASE																												
Upper Housepit 1																												
Fill (F100)	99	99		11	6	4	29		1		6			[illegible]	[illegible]	6		16	28	9	72	55	6	4	38	20	20	7
Wall (F5, 103, etc.)	73	74		-	[illegible]	11	-	12		2	5	2			[illegible]		1		[illegible]	31	2	72	58	11	3	21	13	-
Early Wall (F102, 150)	1	2	-																									
Floor (F31, etc.)	82	75	-	-	13	10	5	17								1	2		4	11	4	60	23	3		2	5	5
Floor Features:																												
Firepit (F7)	1	-	-	-	-																	1						
Firepit (F88, 92)	9	2																										
Pit (F70)		10						1																				
Lower Housepit 1																												
Upper fill (F104, etc.)	39	75	-	1	22	27	1	17	-									1	10	11	3	1	14	2	3	28	8	2
Lower fill (F105)	-	2																										
Wall (F6, etc.)	4	12	-		1	5	-	6	-											1		3	15			1	-	1
Early wall (F114, etc.)	2	5	-													1			1	2		3	1			1		
Floor (F101, etc.)	8	20	-	1	25	61	1	8		1							2		1	2	1	4	2	2	1	7	2	
Floor Features:																												
Pit (F14,135)	-																					1						
Pit (Fill)	-	1																										
Exterior Features:																												
Housepit 2																												
Fill (F750)	5	-	-	-	-	1													1	4								
Wall/floor (F12)	-	1																										
Housepit 3																												
Fill (F250)	2	2	-						1													2	1		3			
Floor (F17)	-	1	-																									
Housepit 4																												
Fill (F200)	10	55	-		13	11	7	4				1					1		2	1	16	3	1			27	7	1
Firepit in fill (F15)	-	-				1																						
Wall (F180, 201, etc.)	10	39	1	1	4	2	2	1											1							3		
Floor (F181, etc.)	3	37	1	-	2	10	-	1													1	1				5	3	
Housepit 5																												
Upper fill (F300)	-	1																				1						
Lower fill (F301)	-	-																				1						
Lower shell/floor? (F43)	-	-	-	-	-																		1					
Housepit 6																												
Upper fill (F400)	3	12	1	-				1										1	1	3		2	3					
Wall (F52)	6	7				1																						
Upper floor (F401)	3	7												5								1						
Lower floor (F403, 21)	-	-																	1			5	2					

Table D-5. Cont'd.

Feature Type	Deer	Deer-sized	Elk	Elk-sized	*Cervidae*, antler	Mountain sheep	Pronghorn	Sheep/Antelope	Bison	Bear	Dog	*Canis* sp.	Man	Beaver	Jackrabbit	Skunk	Porcupine	Marten	Marmot	Salmon	Salmonidae	Cyprinidae	Turtle	Frog	Snake	Pocket gopher	Pocket mouse	Other mouse
HUDNUT PHASE, cont'd.																												
Housepit 7																												
Shell stratum (F23, 86)	31	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	14	–	–	–	–	–
Fill/floor (F500)	38	19	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Housepit 9																												
Fill (F350)	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Upper shell (F49)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
Shell concentration (F45)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Lower shell (F50)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–
Floor (F51)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–
Housepit 11																												
Fill (F61)	1	8	–	–	–	1	–	–	–	–	–	–	–	–	2	–	7	–	15	1	–	2	–	1	–	2	–	–
Floor (F57, 75, etc.)	–	12	–	–	–	3	–	2	–	–	–	–	–	–	–	–	–	–	5	–	–	4	1	–	–	1	–	–
Firepit (F74)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–
Housepit 12																												
Fill/floor (F89, 153)	–	5	–	–	–	1	–	–	–	–	–	–	–	–	2	–	–	–	2	1	–	–	–	–	–	1	1	–
Pit																												
(F35)	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Shell Concentrations																												
(F38, 174)	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	5	–	–	–	–	–	–	–	–	–	–	–
(F41)	2	–	2	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	4	–	–	–	–	–
(F82)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–
(F188)	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	2	–	1
(F217)	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Occupation Surface A																												
Periphery (F155, etc.)	34	17	4	–	–	–	–	9	–	–	–	–	–	–	–	1	–	–	8	–	7	2	5	–	–	–	–	–
Central (F189, 159)	14	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–
Firepit (F161, 162)	1	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
Occupation Surface B																												
Chipping station (F33)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	2	–	–	–	–	–	–
Central zone (F56)	–	1	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
Disposal zone (F122)	1	5	3	2	1	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	1	–	–	–	–	–	–	–
Occupation in Upper House-pit 1 fill (F64, etc.)	4	16	–	–	2	–	1	1	–	–	–	9	–	–	–	–	–	–	–	5	–	8	4	–	–	12	3	–
Firepit (F79)	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table D-5. Cont'd.

Feature Type	Deer	Deer-sized	Elk	Elk-sized	Cervidae, antler	Mountain sheep	Pronghorn	Sheep/Antelope	Bison	Bear	Cat	Canis sp.	Man	Beaver	Jackrabbit	Skunk	Porcupine	Marten	Marmot	Salmon	Salmonidae	Cyprinidae	Turtle	Frog	Snake	Pocket gopher	Pocket mouse	Other mouse
KARTAR PHASE, cont'd.																												
Occupation Surfaces																												
(F47)		1																										
(F117)	5	5			1			1		1							1		4	2	6	19				29	1	
(F141)	71	57		1		18		5											1							2		
(F154,156)	96	112				2		1													1		1			10		
(F157)	29	14																	1									
(F158)	–	6																										
(F170,172)	119	275		1		5																					1	
(F186)																			1									
(F451)	1																											
Stain																												
(F163)	1				5	2																						
Area 7 Bone Concentration																												
(F3)	78	84				14						2							1									
(F8)	96	77		1		6	1	7																				
(F9)	40	35					1	1																				
Bone Concentration																												
(F164)	1	4				1																						
(F120)		5				2																						
Cultural Stratum																												
(F121)	14	5		2	1																1							
Totals																												
Housepit Fill	193	269	–	2	47	48	12	51	1	1		2	1		4	2	15	2	49	32	28	84	88	9	10	96	35	10
Housepit Walls	96	139	2	1	31	19	2	21		2	5	2			1	1	1		18	34	2	78	74	11	3	35	11	4
Housepit Floors	144	190	1	1	40	95	6	32		1					2	2	4		14	14	6	11	32	10	1	14	11	5
Area 7 Bone Concentration	174	143	–	1	–	40	2	8											1									
Occupaton Surfaces	315	512	9	4	4	29	1	28		1		11					4		96	8	96	33	10			35	5	
Other Exterior Features	20	15	2	2	7	7									1	4	5		1	1		4	4			2	1	1
HUDNUT PHASE																												
FMR Scatter																												
(F110)	–	1	–																			1				1		

APPENDIX E:

DESCRIPTION OF CONTENTS OF UNCIRCULATED APPENDICES

Detailed data from two different analyses are available in the form of hard copies of computer files with accompanying coding keys.

Functional analysis data include provenience (site, analytic zone, excavation unit and level, and feature number and level (if applicable); object master number; abbreviated functional object type; and coding that describes each tool on a given object. Data normally are displayed in alphanumeric order by site, analytic zone, functional object type, and master number. Different formats may be available upon request depending upon research focus.

Faunal analysis data include provenience (site, analytic zone, excavation unit and level, feature number, and level (if applicable); taxonomy (family, genus, species); skeletal element; portion; side; sex; burning/butchering code; quantity; and age. Data normally are displayed in alphanumeric order by site, analytic zone, provenience, taxonomy, etc.

To obtain copies of the uncirculated appendices contact U.S. Army Corps of Engineers, Seattle District, Post Office Box C-3755, Seattle, Washington, 98124. Copies also are being sent to regional archives and libraries.